

**Draw and label a typical plant cell.**

a

**Draw and label the parts of a typical bacterial cell.**

d

**Describe how to prepare an uncontaminated culture of bacteria using the aseptic technique.**

g

**Which organelle is:**

• the site of anaerobic respiration?

• the site of protein synthesis?

• the site of photosynthesis?

**Why do cells undergo mitosis?**

e

**What happens to the cell during:**

• interphase?

• mitosis?

**Name 3 substances that are transported into or out of animal cells by diffusion:**

i

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

Light microscopes have objective lenses.  
**What is the purpose of the objective lens?**

l

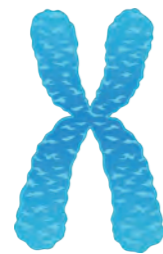
**Name the tubes that transport water up the stem of a plant.**

m

**How many chromosomes does:**

• a human skin cell contain?

• a human gamete contain?



b

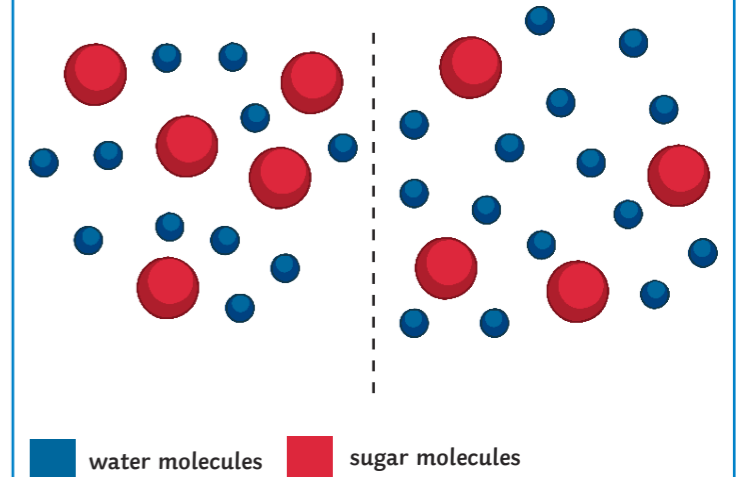
**List 5 important keywords from this unit.**

j

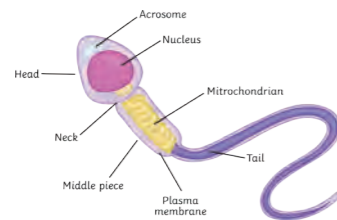
1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

**On the diagram below, draw an arrow to show the direction of the net movement of water molecules.**

n



**Sperm cells are specialised cells. Explain how the acrosome helps the sperm cell to carry out its function.**



c

**What are 'embryonic' stem cells?**

f

**Name 2 medical conditions that could be treated with embryonic stem cells in the future.**

1. \_\_\_\_\_
2. \_\_\_\_\_

**Describe an advantage of using therapeutic cloning to treat disease.**

k

**What is osmosis?**

o

**My main areas for improvement in this unit are:**

o

Draw and label a typical animal cell.

a

Which organelle is:

- the site of aerobic respiration?

- controls the movement of substances in and out of the cell?

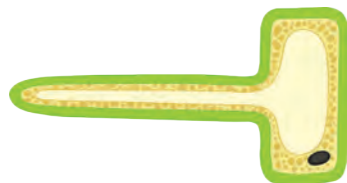
- contains the genetic information?

An elephant sperm cell contains 28 chromosomes. How many chromosomes would be in an elephant:

- liver cell?

- ovum?

Root hair cells are specialised cells. Describe how the root hair cell is adapted to carry out its function.



c

A bacterium can divide once every 20 minutes. A piece of chicken was contaminated with 5 bacteria; how many bacteria will there be on the chicken after 3 hours?

d

Describe how active transport is used by:

- plants

- animals

e

Where in the body are adult stem cells found and how do they differ from embryonic stem cells?

h

The unit 'centimetres' is written as 'cm'. What do each of the following units represent?

mm: \_\_\_\_\_

µm: \_\_\_\_\_

nm: \_\_\_\_\_

pm: \_\_\_\_\_

i

Write each of the following numbers in standard form.

2500; \_\_\_\_\_

0.003; \_\_\_\_\_

4 200 000; \_\_\_\_\_

0.00000006; \_\_\_\_\_

n

Which has a bigger 'surface area to volume' ratio, an elephant or a mouse?

o

What is the equation for calculating the magnification of an image?

p

Plants can be cloned from meristem cells. Give two advantages of cloning plants.

j

List 5 important keywords from this topic.

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

5. \_\_\_\_\_

k

Why do some people object to embryonic stem cell research?

q

Describe 3 ways that exchange surfaces are adapted to their function.

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

f

Electron microscopes have better resolution than light microscopes. What does 'resolution' mean?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

l

How do prokaryotic cells differ from eukaryotic cells?

r

Describe 2 ways in which active transport is different to diffusion.

1. \_\_\_\_\_

2. \_\_\_\_\_

g

State 2 factors that affect the rate of diffusion.

1. \_\_\_\_\_

2. \_\_\_\_\_

m

My main areas for improvement in this unit are:

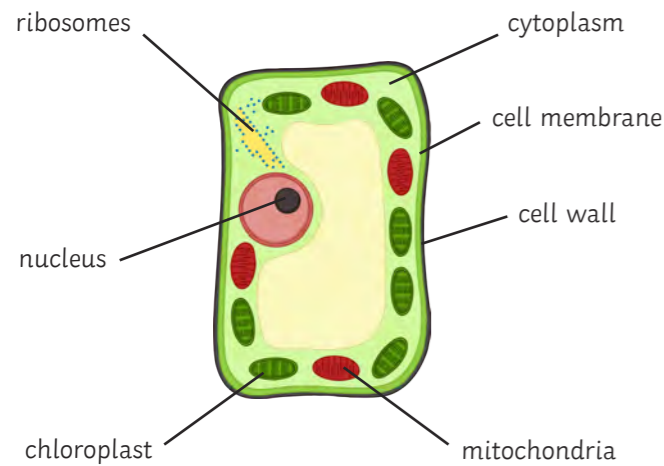
\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

s

**Draw and label a typical plant cell.**



**Which organelle is:**

- the site of anaerobic respiration?

Cytoplasm

- the site of protein synthesis?

Ribosomes

- the site of photosynthesis?

Chloroplasts

**How many chromosomes does:**

- a human skin cell contain?

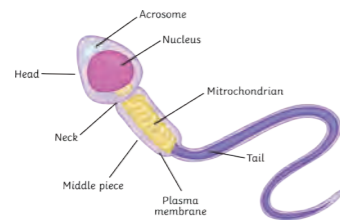
46 / 23 pairs (diploid)

- a human gamete contain?

23 single (haploid)

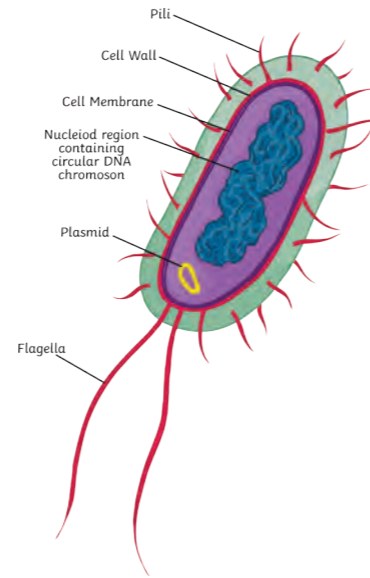


**Sperm cells are specialised cells. Explain how the acrosome helps the sperm cell to carry out its function.**



The acrosome contains enzymes to digest through the egg cell membrane.

**Draw and label the parts of a typical bacterial cell.**



**Why do cells undergo mitosis?**

To produce new cells for growth and repair.

**What happens to the cell during:**

- interphase?

The cell grows, increases the amount of organelles and replicates its DNA.

- mitosis?

1. Chromosomes line up at the centre of the cell and the copies are pulled apart by spindle fibres to opposite ends of the cell.

2. Nuclear membranes form around the chromosomes to make 2 nuclei.

3. Finally, the cell splits into two identical 'daughter' cells.

**What are 'embryonic' stem cells?**

Undifferentiated cells found in the early embryo.

**Name 2 medical conditions that could be treated with embryonic stem cells in the future.**

1. Diabetes
2. Spinal injuries/paralysis

**Describe how to prepare an uncontaminated culture of bacteria using the aseptic technique.**

1. Sterilise the Petri dish, inoculating loop, culture medium and working area to kill any unwanted microorganisms.
2. Lift the lid slightly to inoculate the plate and replace quickly to prevent microorganisms from the air getting in.
3. Secure the Petri dish lid with a small piece of tape.

**Diffusion is:**

The movement of water particles from a high water concentration to a lower water concentration across a partially permeable membrane.

The spreading out of the particles of any gas, or liquid from an area of high concentration to an area of lower concentration.

The movement of particles from a low concentration to a higher concentration.

**Name 3 substances that are transported into or out of animal cells by diffusion:**

1. Oxygen
2. Carbon dioxide
3. Amino acids

**List 5 important keywords from this unit.**

1. Eukaryotic/Prokaryotic
2. Differentiation
3. Mitosis
4. Aseptic technique
5. Osmosis

**Describe an advantage of using therapeutic cloning to treat disease.**

The stem cells would have the same DNA as the patient, so would not be rejected by the body.

**What is osmosis?**

The movement of water molecules from an area of high water concentration to an area of lower water concentration, across a partially permeable membrane.

Light microscopes have objective lenses.

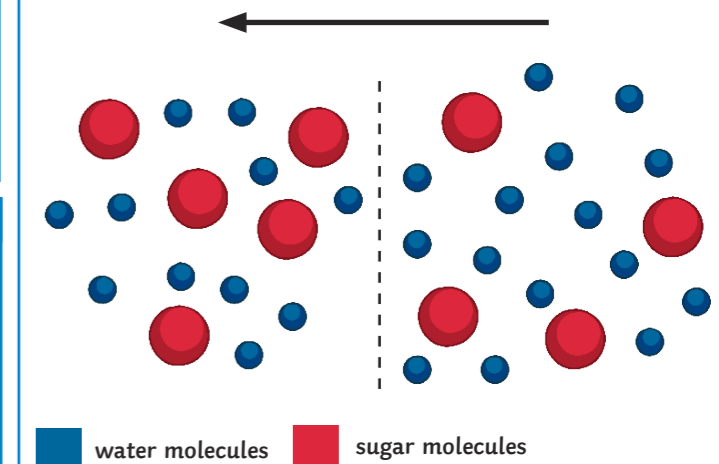
**What is the purpose of the objective lens?**

To form and magnify an image of the specimen.

**Name the tubes that transport water up the stem of a plant.**

Xylem

**On the diagram below, draw an arrow to show the direction of the net movement of water molecules.**



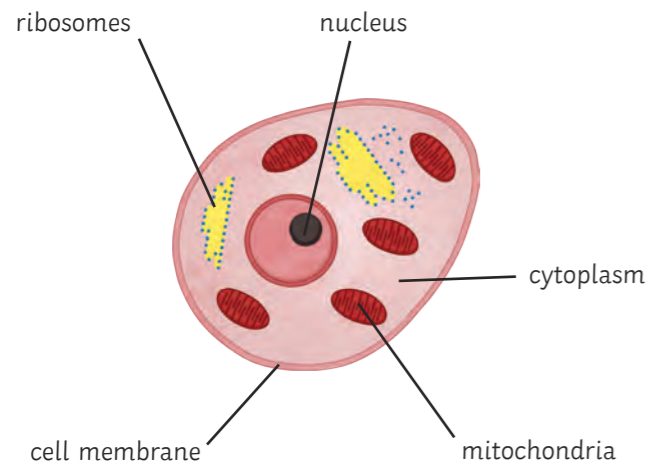
**My main areas for improvement in this unit are:**

\_\_\_\_\_

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\_\_\_\_\_

Draw and label a typical animal cell.



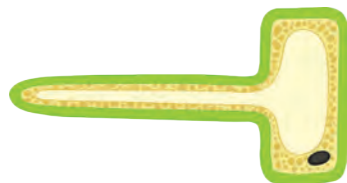
Which organelle is:

- the site of aerobic respiration?  
Mitochondria
- controls the movement of substances in and out of the cell?  
Cell membrane
- contains the genetic information?  
Nucleus

An elephant sperm cell contains 28 chromosomes. How many chromosomes would be in an elephant:

- liver cell?  
56
- ovum?  
28

Root hair cells are specialised cells. Describe how the root hair cell is adapted to carry out its function.



Has a large surface area for the rapid absorption of water and mineral ions from the soil.

A bacterium can divide once every 20 minutes. A piece of chicken was contaminated with 5 bacteria; how many bacteria will there be on the chicken after 3 hours?

Time	Number
0	5
20	10
40	20
60	40.....etc
180	2560

Describe how active transport is used by:

- plants  
To obtain mineral ions from the soil
- animals  
To absorb nutrients (e.g. glucose), when they are at low concentrations, from the small intestine.

Describe 3 ways that exchange surfaces are adapted to their function.

1. Large surface area
2. Thin walls
3. Moist/good blood supply (animals)

Describe 2 ways in which active transport is different to diffusion.

1. Moves against a concentration gradient (low to high)
2. Requires energy

Where in the body are adult stem cells found and how do they differ from embryonic stem cells?

Found in the bone marrow. Can only turn into certain cell types, such as blood cells.

The unit 'centimetres' is written as 'cm'. What do each of the following units represent?

- mm: millimetres
- µm: micrometres
- nm: nanometres
- pm: picometres

Plants can be cloned from meristem cells. Give two advantages of cloning plants.

Farmers can produce clones of a desired plant quickly and cheaply. Save rare species from extinction.

List 5 important keywords from this topic.

1. Diffusion
2. Active transport
3. Meristem
4. Magnification
5. Resolution

Electron microscopes have better resolution than light microscopes. What does 'resolution' mean?

The ability to distinguish between 2 points, so higher resolution produces a clearer image.

State 2 factors that affect the rate of diffusion.

1. Temperature
2. Concentration gradient

Write each of the following numbers in standard form.

- 2500;  $2.5 \times 10^3$
- 0.003;  $3 \times 10^{-3}$
- 4 200 000;  $4.2 \times 10^6$
- 0.00000006;  $6 \times 10^{-8}$

Which has a bigger 'surface area to volume' ratio, an elephant or a mouse?

Mouse

What is the equation for calculating the magnification of an image?

$$\text{Magnification} = \frac{\text{image size}}{\text{real size}}$$

Why do some people object to embryonic stem cell research?

They believe that all embryos have the potential to become a human being, so should not be used for experimentation.

How do prokaryotic cells differ from eukaryotic cells?

Bacterial cells are much smaller, they don't have a nucleus, they don't have mitochondria or chloroplasts.

My main areas for improvement in this unit are:

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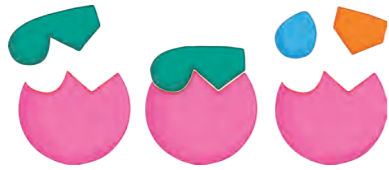
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Complete the table below.

Enzyme	Site of Production	Substrate	Products
amylase			glucose
pepsin		protein	
lipase	pancreas		

The diagram below shows the 'lock & key' model of enzyme function. Label the diagram using the following words:

enzyme, active site, substrate, products, enzyme-substrate complex



Describe how to carry out the test for reducing sugars.

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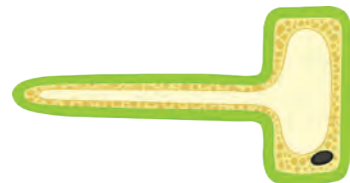


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Describe how this root hair cell is adapted for the efficient uptake of water and mineral ions.




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Place the following structures in order from smallest to largest:

cell, organ, nucleus, tissue, organism

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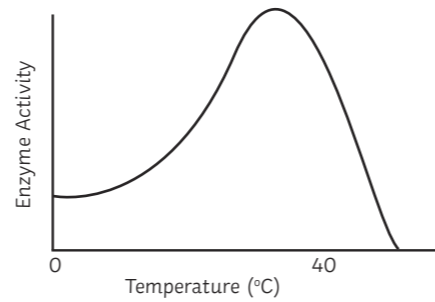


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Use the graph below to describe how temperature affects enzyme function.




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Enzymes are described as being 'specific' to a substrate. What does this mean? Use a labelled diagram to help your explanation.

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Describe how to test for protein

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Bile is made in the liver and stored in the gall bladder. Explain how bile helps digestion.

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Transpiration is:

The movement of water molecules from a high water concentration to a lower water concentration across a partially permeable membrane.

The evaporation and diffusion of water from the leaves of a plant.

The movement of glucose molecules around the plant.

Name 3 factors that affect the rate of transpiration.

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

From which part of the human digestive system is nutrients absorbed into the bloodstream?

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Where in the plant is meristem tissue located?

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List 5 important keywords from this unit.

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

5. \_\_\_\_\_

The xylem tissue is composed of hollow tubes strengthened by lignin. What is the function of xylem tissue?

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Why are enzymes referred to as 'biological catalysts'?

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Describe how to test for starch.

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What is the function of phloem tissue?

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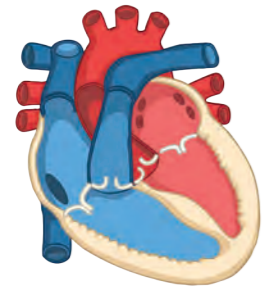
My main areas for improvement in this unit are:

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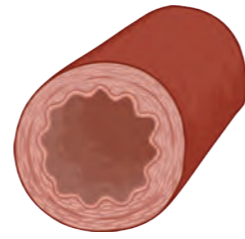


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**a** Label the following blood vessels on the diagram of the heart: aorta, vena cava, pulmonary artery, pulmonary vein.



**d** Describe how the structure of an artery is related to its function.



**h** Why does the left ventricle have a thicker, more muscular wall than the right ventricle?

**i** Name the four main components of the blood and describe their function.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

**n** Describe 3 ways that the lungs are adapted for gaseous exchange.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

**b** Label the following parts on the diagram below: trachea, bronchi, bronchiole, alveolus.



**e** In coronary heart disease, layers of fatty material build up inside the coronary arteries. Explain how this can lead to a 'heart attack'.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**j** What is a 'carcinogen'? Give an example.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**o** A problem with heart transplants is rejection of the donor heart. What is 'rejection'?

\_\_\_\_\_

\_\_\_\_\_

**f** Stents can be used to treat coronary heart disease. Give one advantage and one disadvantage of using stents.

Advantage

\_\_\_\_\_

\_\_\_\_\_

Disadvantage

\_\_\_\_\_

\_\_\_\_\_

**k** List 5 important keywords from this unit.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

**p** Name the group of cells that controls the resting heart rate.

\_\_\_\_\_

**c** Describe how smoking tobacco affects:

Adults

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Unborn babies

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**g** Describe 3 lifestyle factors that can impact a person's physical and mental wellbeing.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

**l** Explain how an infection with a microorganism could lead to the development of other, non-communicable diseases.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**r** What is the difference between a benign and a malignant tumour?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**m** Describe how a faulty heart valve will affect a person's health.

\_\_\_\_\_

**s** My main areas for improvement in this unit are:

\_\_\_\_\_

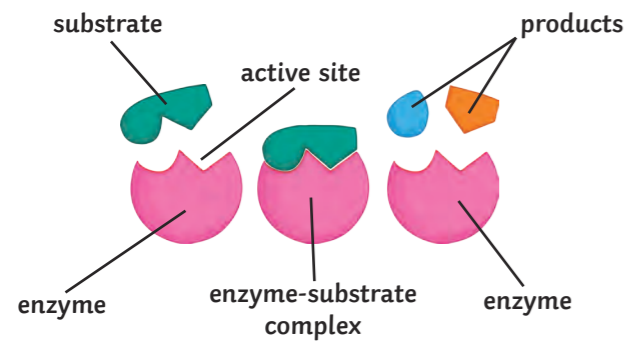
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\_\_\_\_\_

Complete the table below.

Enzyme	Site of Production	Substrate	Products
amylase	salivary glands/ pancreas	starch	maltose/ glucose
pepsin	stomach	protein	amino acids
lipase	pancreas	fats	fatty acids & glycerol

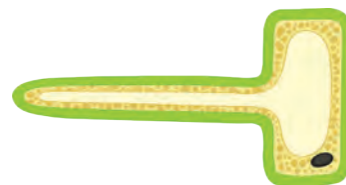
The diagram below shows the 'lock & key' model of enzyme function. Label the diagram using the following words:



Describe how to carry out the test for reducing sugars.

1. Place the test sample into a test tube (about 2ml).
2. Add an equal amount of Benedicts reagent.
3. Heat in a water bath for 5 minutes.
4. The colour will change from blue to either green/yellow/red depending on the amount of reducing sugar present.

Describe how this root hair cell is adapted for the efficient uptake of water and mineral ions.



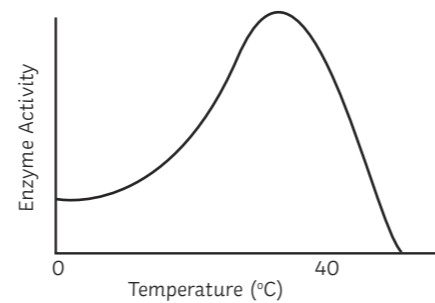
They have a large surface area for the rapid absorption of water and mineral ions from the soil.

Place the following structures in order from smallest to largest:

cell, organ, nucleus, tissue, organism

nucleus, cell, tissue, organ, organism

Use the graph below to describe how temperature affects enzyme function.



Initially, as temperature increases, the rate of enzyme activity also increases, up to 40°C, which is the optimum temperature. After 40°C, as the temperature increases the rate of enzyme activity decreases.

Enzymes are described as being 'specific' to a substrate. What does this mean? Use a labelled diagram to help your explanation.

A diagram showing active site of enzyme has a complimentary shape to the substrate molecule. The active site of the enzyme has a unique shape, only a substrate with a complimentary shape can fit and bind to form an enzyme-substrate complex.

Describe how to test for protein

1. Place the test sample into a test tube (about 2ml)
2. Add an equal amount of Biuret reagent and mix.
3. The colour will change from blue to purple if protein is present.

Bile is made in the liver and stored in the gall bladder. Explain how bile helps digestion.

Bile neutralises stomach acid to raise the pH so protease enzymes can work.

It also emulsifies fats to give them a larger surface area for lipase to work, which speeds up digestion.

Transpiration is:

The movement of water molecules from a high water concentration to a lower water concentration across a partially permeable membrane.

The evaporation and diffusion of water from the leaves of a plant.

The movement of glucose molecules around the plant.

Name 3 factors that affect the rate of transpiration.

Any 3 from;

Temperature, Light intensity, Air flow or Humidity.

From which part of the human digestive system is nutrients absorbed into the bloodstream?

Small intestine.

Where in the plant is meristem tissue located?

Growing tips of roots and shoots.

List 5 important keywords from this unit.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

Why are enzymes referred to as 'biological catalysts'?

They speed up useful chemical reactions in the body.

Describe how to test for starch.

Place the test sample into a test tube.

Add a few drops of iodine solution and mix.

The colour will change from orange to blue/black if starch is present.

What is the function of phloem tissue?

To transport food substances (dissolved sugars) around the plant. This process is called translocation.

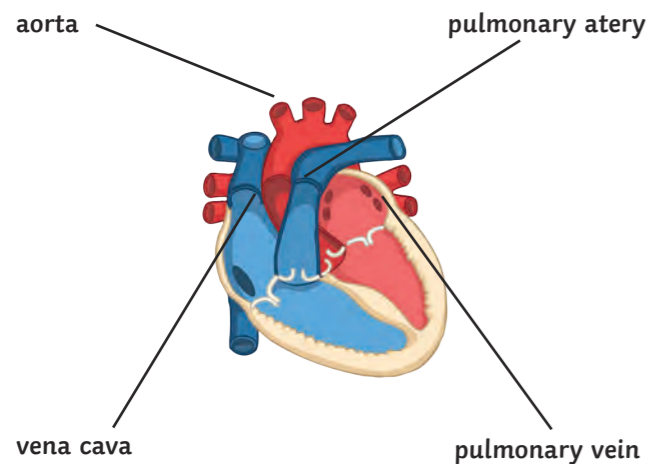
My main areas for improvement in this unit are:

\_\_\_\_\_

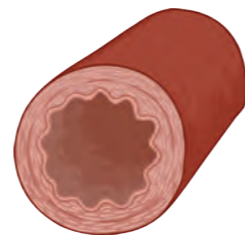
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\_\_\_\_\_

Label the following blood vessels on the diagram of the heart:



Describe how the structure of an artery is related to its function.



Thick layers of muscle for strength and elastic fibres so that they can spring back to help withstand high blood pressure.

Why does the left ventricle have a thicker, more muscular wall than the right ventricle?

The left ventricle has to pump blood at high pressure so that it can reach all body cells. Whereas, the right ventricle only has to pump blood to the lungs.

Name the four main components of the blood and describe their function.

1. Red blood cells – transport oxygen.
2. White blood cells – defend against pathogens.
3. Platelets – help to clot the blood.
4. Plasma – liquid part of the blood, carries many substances e.g. glucose, hormones.

Describe 3 ways that the lungs are adapted for gaseous exchange.

Any 3 from: Large surface area, Moist lining, Thin walls or good blood supply.

In coronary heart disease, layers of fatty material build up inside the coronary arteries. Explain how this can lead to a 'heart attack'.

The layers of fatty material block the coronary arteries and restrict blood flow to heart muscle cells. This results in a lack of oxygen and the heart muscle cells stop respiring which can lead to a heart attack.

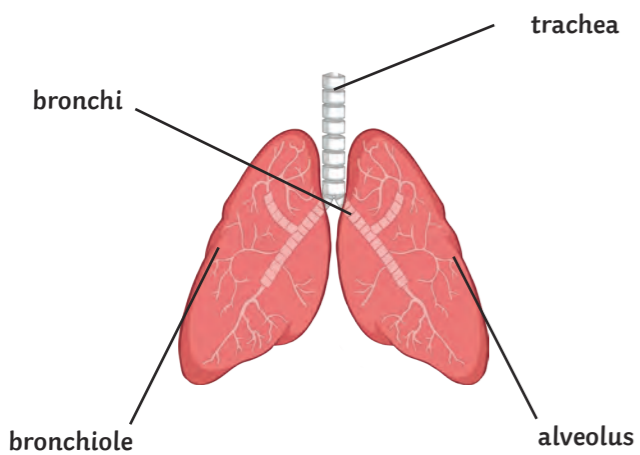
What is a 'carcinogen'? Give an example.

Substance/chemical that causes cancer e.g. the chemicals in cigarette smoke.

A problem with heart transplants is rejection of the donor heart. What is 'rejection'?

When the body's immune system (white blood cells) attacks and destroys the donor heart muscle cells.

Label the following parts on the diagram below:



Stents can be used to treat coronary heart disease. Give one advantage and one disadvantage of using stents.

Advantage

Patients recover quickly and they are effective for a long time.

Disadvantage

There is a risk of the patient developing a blood clot near the stent, which can lead to a heart attack.

List 5 important keywords from this unit.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

Name the group of cells that controls the resting heart rate.

Pacemaker

Describe how smoking tobacco affects:

Adults

Can cause lung disease, including cancer, and cardiovascular disease.

Unborn babies

Can result in low birth weight and premature birth.

Explain how an infection with a microorganism could lead to the development of other, non-communicable diseases.

Infection with some viruses can lead to the development of cancer (e.g. HPV infection and cervical cancer). Also, infection with pathogens can sometimes trigger allergic reactions and worsen asthma.

What are 'statins'?

Drugs that reduce the amount of LDL cholesterol in the blood and so reduce the build up of fatty deposits in the coronary arteries.

Describe 3 lifestyle factors that can impact a person's physical and mental wellbeing.

Any 3 from: Diet, exercise, stress, smoking, drinking alcohol.

Describe how a faulty heart valve will affect a person's health.

Breathlessness, fatigue, tiredness.

What is the difference between a benign and a malignant tumour?

A benign tumour remains in one place and doesn't invade other tissues in the body – not usually dangerous. A malignant tumour spreads to other parts of the body when cells break off and travel in the bloodstream to form secondary tumours.

My main areas for improvement in this unit are:

\_\_\_\_\_

\_\_\_\_\_

Write a definition for each type of disease and give two examples.

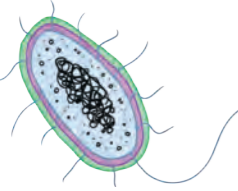
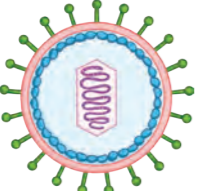
communicable disease: \_\_\_\_\_

\_\_\_\_\_

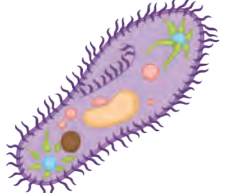
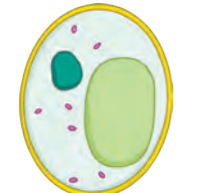
non-communicable disease: \_\_\_\_\_

\_\_\_\_\_

Label the pathogens below that cause infectious diseases.

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Name three ways that pathogens are spread and give at least one example.

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

How do pathogens cause disease? Fill in the gaps.

\_\_\_\_\_ reproduce rapidly by \_\_\_\_\_

\_\_\_\_\_. They may produce \_\_\_\_\_ that damage tissues and make us feel ill.

\_\_\_\_\_ take over the cells of your body. They live and rapidly \_\_\_\_\_ inside. This causes cell damage.

Simple hygiene measures are one of the most effective ways of preventing the spread of pathogens.

List five ways we can be more hygienic below:

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

List three other methods for preventing the spread of pathogens.

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

**Salmonella**

What type of pathogen is it caused by?

\_\_\_\_\_

What are the symptoms?

\_\_\_\_\_

How is it spread?

\_\_\_\_\_

What can we do about it?

\_\_\_\_\_

**Measles**

What type of pathogen is it caused by?

\_\_\_\_\_

What are the symptoms?

\_\_\_\_\_

How is it spread?

\_\_\_\_\_

What can we do about it?

\_\_\_\_\_

**Tobacco Mosaic Virus**

What type of pathogen is it caused by?

\_\_\_\_\_

What are the symptoms?

\_\_\_\_\_

How is it spread?

\_\_\_\_\_

What can we do about it?

\_\_\_\_\_

**Gonorrhoea**

What type of pathogen is it caused by?

\_\_\_\_\_

What are the symptoms?

\_\_\_\_\_

How is it spread?

\_\_\_\_\_

What can we do about it?

\_\_\_\_\_

**HIV**

What type of pathogen is it caused by?

\_\_\_\_\_

What are the symptoms?

\_\_\_\_\_

How is it spread?

\_\_\_\_\_

What can we do about it?

\_\_\_\_\_

**Malaria**

What type of pathogen is it caused by?

\_\_\_\_\_

What are the symptoms?

\_\_\_\_\_

How is it spread?

\_\_\_\_\_

What can we do about it?

\_\_\_\_\_

**Rose Black Spot**

What type of pathogen is it caused by?

\_\_\_\_\_

What are the symptoms?

\_\_\_\_\_

How is it spread?

\_\_\_\_\_

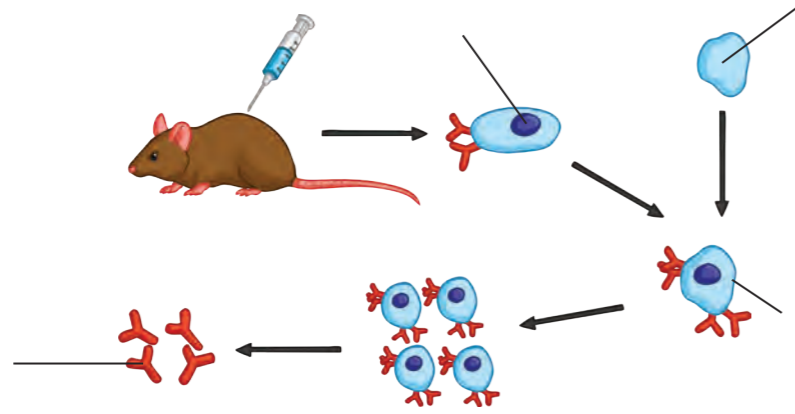
What can we do about it?

\_\_\_\_\_



Label the diagram with the following keywords:

- lymphocyte
- monoclonal antibodies
- hybridoma
- tumour cell



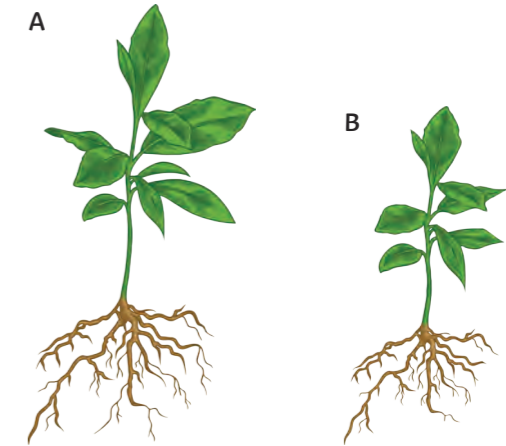
a

Give an example of a plant disease caused by each type of pathogen below.

virus: \_\_\_\_\_  
 fungus: \_\_\_\_\_  
 insect: \_\_\_\_\_

h

Plant B has an ion deficiency.



Identify which ion is deficient.

Explain how this ion deficiency causes the condition in the diagram.

k

Monoclonal antibodies are specific. What does this mean?

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

b

Explain how monoclonal antibodies can be used to treat cancer.

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

e

Why are monoclonal antibodies less widely used than intended when they were first developed?

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

c

Describe five ways in which monoclonal antibodies can be used.

1. \_\_\_\_\_  
 \_\_\_\_\_
2. \_\_\_\_\_  
 \_\_\_\_\_
3. \_\_\_\_\_  
 \_\_\_\_\_
4. \_\_\_\_\_  
 \_\_\_\_\_
5. \_\_\_\_\_  
 \_\_\_\_\_

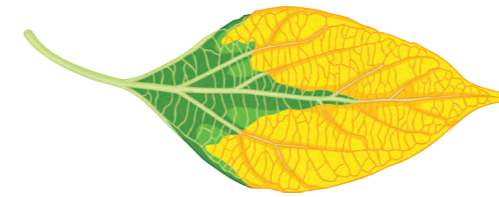
d

List seven ways that you can tell if a plant is diseased.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_

f

This plant has an ion deficiency.



Identify which ion is deficient.

Explain how this ion deficiency causes the condition in the diagram.

i

Name three physical defence responses that help a plant to defend against microorganisms.

1. \_\_\_\_\_  
 \_\_\_\_\_
2. \_\_\_\_\_  
 \_\_\_\_\_
3. \_\_\_\_\_  
 \_\_\_\_\_

l

Give three ways to identify plant diseases.

1. \_\_\_\_\_  
 \_\_\_\_\_
2. \_\_\_\_\_  
 \_\_\_\_\_
3. \_\_\_\_\_  
 \_\_\_\_\_

g

Name three mechanical adaptations that plants have to protect themselves against herbivores.

1. \_\_\_\_\_  
 \_\_\_\_\_
2. \_\_\_\_\_  
 \_\_\_\_\_
3. \_\_\_\_\_  
 \_\_\_\_\_

j

Name two chemical plant defence responses.

1. \_\_\_\_\_  
 \_\_\_\_\_
2. \_\_\_\_\_  
 \_\_\_\_\_

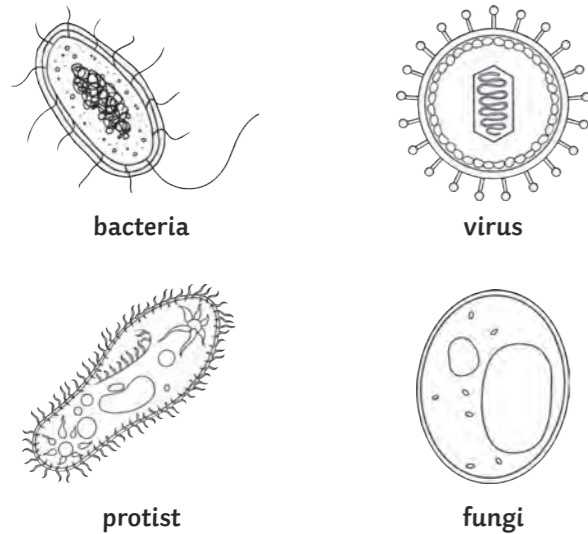
m

Write a definition for each type of disease and give two examples.

communicable disease: **Caused by pathogens and can be passed from one person to another. Possible examples: measles, salmonella, gonorrhoea, HIV, tobacco mosaic virus, rose black spot, malaria.**

non-communicable disease: **Can not be passed on from one person to another. Possible examples: heart disease, diabetes, cancer.**

Label the pathogens below that cause infectious diseases.



Name three ways that pathogens are spread and give at least one example.

1. **By air: cold, flu, tuberculosis.**
2. **By direct contact: malaria, STDs, HIV.**
3. **By water: cholera, salmonellosis.**

How do pathogens cause disease? Fill in the gaps.

**Bacteria** reproduce rapidly by **binary fission**. They may produce **toxins** that damage tissues and make us feel ill.

**Viruses** take over the cells of your body. They live and rapidly **reproduce** inside. This causes cell damage.

Simple hygiene measures are one of the most effective ways of preventing the spread of pathogens.

List five ways we can be more hygienic below:

1. **Washing hands after going to the toilet, before cooking or eating and after contact with animals or sick people.**
2. **Using disinfectants on surfaces.**
3. **Keeping raw meat away from food that is eaten uncooked.**
4. **Coughing or sneezing into a tissue.**
5. **Keeping agricultural machinery, and people using it, clean to prevent the spread of plant diseases.**

List three other methods for preventing the spread of pathogens.

1. **Keep infected individuals in isolation.**
2. **Destroy the vectors that carry pathogens.**
3. **vaccination**

**Salmonella**

What type of pathogen is it caused by?  
**bacteria**

What are the symptoms?  
**Fever, abdominal cramps, vomiting and diarrhoea.**

How is it spread?  
**Eating undercooked food or food contaminated from contact with raw meat, e.g. raw chicken.**

What can we do about it?  
**Poultry are vaccinated to control the spread.**

**Measles**

What type of pathogen is it caused by?  
**virus**

What are the symptoms?  
**A fever and red rash on the skin. Can be fatal if there are complications.**

How is it spread?  
**By air - the inhalation of droplets from coughs and sneezes.**

What can we do about it?  
**There is no treatment, so young children are vaccinated against it.**

**Tobacco Mosaic Virus**

What type of pathogen is it caused by?  
**virus**

What are the symptoms?  
**Mosaic discolouration of the leaves which reduces photosynthesis and affects the growth of the plant.**

How is it spread?  
**Direct contact between diseased plant material and healthy plants. Insects can also act as vectors.**

What can we do about it?  
**TMV resistant strains. Good hygiene and pest control.**

**Gonorrhoea**

What type of pathogen is it caused by?  
**bacteria**

What are the symptoms?  
**Thick yellow or green discharge from the vagina or penis and pain on urinating.**

How is it spread?  
**sexual contact**

What type of pathogen is it caused by?  
**Treat with antibiotics. Use a barrier method of contraception.**

**HIV**

What type of pathogen is it caused by?  
**virus**

What are the symptoms?  
**Initially causes a flu-like illness. Damages the immune system so that it can't deal with other infections or cancers.**

How is it spread?  
**Sexual contact or exchange of bodily fluids, such as blood.**

What can we do about it?  
**Antiretroviral drugs help to stop the virus attacking the immune system. There is no cure or vaccine.**

**Malaria**

What type of pathogen is it caused by?  
**protist**

What are the symptoms?  
**Recurrent fever - can be fatal.**

How is it spread?  
**Mosquitoes act as a vector, passing the protist to the human bloodstream when they feed on the blood.**

What can we do about it?  
**Preventing the vectors (mosquitoes) from breeding. Using mosquito nets and repellents to avoid being bitten. Taking antimalarial drugs.**

**Rose Black Spot**

What type of pathogen is it caused by?  
**fungus**

What are the symptoms?  
**Purple or black spots develop on the leaves. Leaves turn yellow and fall off prematurely which reduces photosynthesis, affecting the growth of the plant.**

How is it spread?  
**Spores are carried by water or wind.**

What can we do about it?  
**Use fungicides to treat the plant. Remove and destroy affected leaves.**


Explain how your skin prevents microorganisms getting into your body.

It acts as a barrier to prevent pathogens reaching the tissues beneath. Platelets quickly form scabs to seal any cuts.

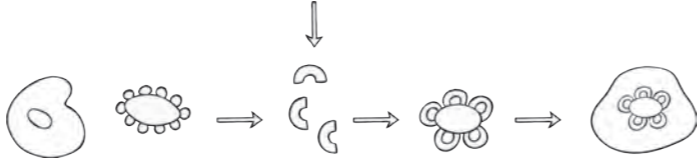
It produces antimicrobial secretions to kill pathogens.

It is covered with microorganisms that act as an extra barrier to entry.

Describe each role of a white blood cell and explain how it protects you against disease.



Some white blood cells ingest pathogens, digesting and destroying them.

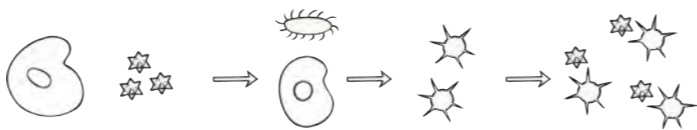


Some white blood cells produce antibodies which are chemicals that target specific pathogens and destroy them. An antibody only works for one type of pathogen.

Explain how the respiratory system is adapted to reduce the entry of microorganisms.

The lining of the nose produces mucus and is full of hairs to trap particles in the air that may contain pathogens.

The lining of the trachea and bronchi produce mucus which is moved to the back of the throat by the cilia projections of epithelial cells.



Some white blood cells produce antitoxins that counteract the toxins released by pathogens.

Explain how the digestive system is adapted to reduce the entry of microorganisms.

The stomach produces hydrochloric acid that destroys pathogens.

Tick the correct boxes.

	Treats Symptoms	Kills Bacteria	Kills Viruses
painkillers	✓		
antibiotics		✓	

Define the following terms:

vaccine: **Dead or inactivate form of a disease-causing microorganism.**

antigen: **Unique protein on the surface of cells.**

antibody: **Produced by white blood cells to recognise specific antigens.**

herd immunity: **When vaccination of a significant proportion of the population provides protection for individuals who are not immune.**

Describe how vaccinations prevent illness.

1. **Introduce small quantities of dead or inactive virus;**
2. **this stimulates white blood cells to produce antibodies;**
3. **if the live pathogen enters the body, the white blood cells recognise it and respond quickly so you don't get ill.**

Fill in the missing words:

The use of **antibiotics** has greatly reduced the deaths from infectious **bacterial** diseases. However, the evolution of strains that are **resistant** to antibiotics is a concern.

**Antibiotics** are specific which means they **only work against certain bacteria.**

State where the following drugs were discovered.

the heart drug digitalis: **foxglove**

the painkiller aspirin: **willow**

the antibiotic penicillin: **Penicillium mould**

Who discovered penicillin?  
**Alexander Fleming**

Why is it difficult to discover new medicines?  
**You need to find a chemical that kills bacteria without damaging human cells.**

Where do most new drugs now come from?

**Synthesised by chemists in a lab, but they might still start from a chemical extracted from a plant.**

What has to happen before a drug can be used?

1. **Test whether the drug is effective against the disease.**
2. **Check that the drug is not toxic.**
3. **Work out what dose to use.**

Describe each process of drug testing.

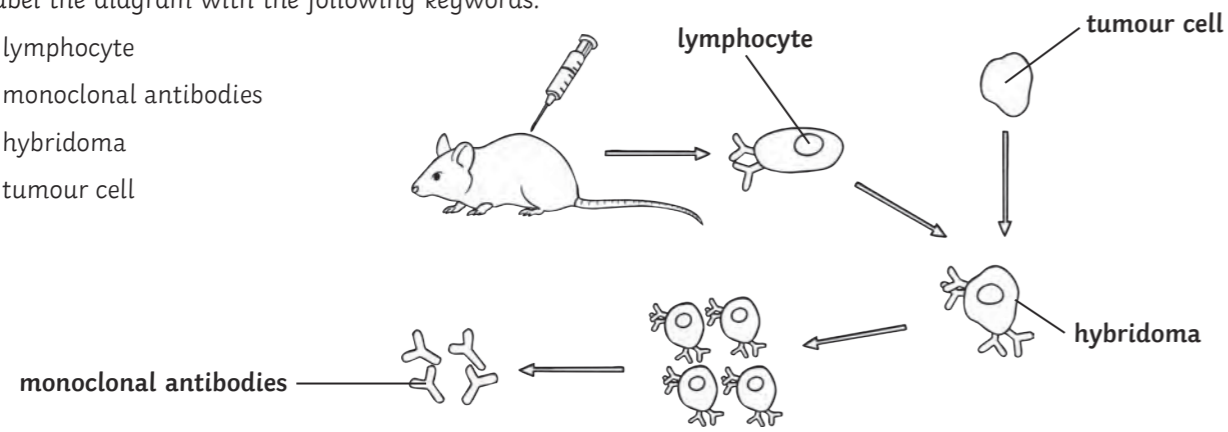
preclinical testing: **This happens in a laboratory using cells, tissues and animals.**

clinical trials: **To use healthy volunteers and patients. Starting off with very low doses to check for side effects. If it is safe it is tested on patients.**

double-blind trials: **These tell you how effective a medicine is. Neither the patient or the doctor know whether the patient has been given a placebo or the real drug.**

Label the diagram with the following keywords:

- lymphocyte
- monoclonal antibodies
- hybridoma
- tumour cell



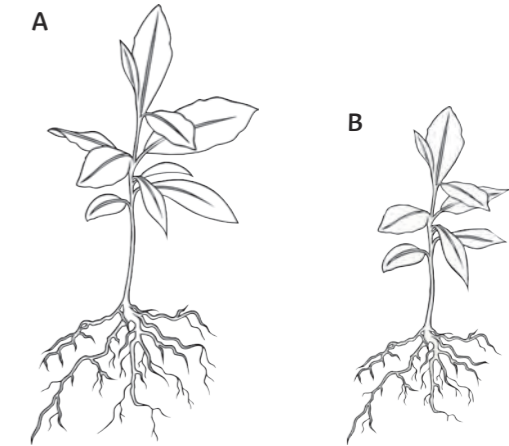
a

Give an example of a plant disease caused by each type of pathogen below.

- virus: **tobacco mosaic virus**
- fungus: **black spot**
- insect: **aphids**

h

Plant B has an ion deficiency.



k

Monoclonal antibodies are specific. What does this mean?

**They only bind to one antigen. This means they can be used to target a specific chemical or cell in the body.**

b

Explain how monoclonal antibodies can be used to treat cancer.

**The antibody can be bound to a radioactive substance, a toxic drug or a chemical which stops cells growing and dividing. It delivers the substance to the cancer cells and because it is specific to the cancer cells, it doesn't harm other cells in the body.**

e

Why are monoclonal antibodies less widely used than intended when they were first developed?

**They create more side effects than expected.**

c

Describe five ways in which monoclonal antibodies can be used.

1. **For diagnosis, such as in pregnancy tests.**
2. **For measuring the levels of chemicals (such as hormones) in the blood.**
3. **For detecting pathogens.**
4. **For research, to identify or locate specific molecules in cells or tissues.**
5. **To treat some diseases.**

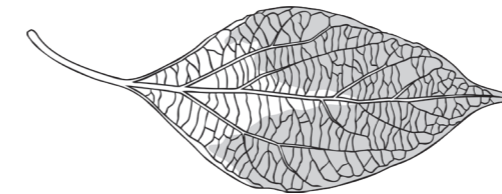
d

List seven ways that you can tell if a plant is diseased.

1. **stunted growth**
2. **spots on leaves**
3. **areas of decay/rot**
4. **growths**
5. **malformed stems or leaves**
6. **discolouration**
7. **pests**

f

This plant has an ion deficiency.



i

Identify which ion is deficient.

**magnesium**

Explain how this ion deficiency causes the condition in the diagram.

**Magnesium is needed to make chlorophyll. The leaves become yellow because there isn't enough chlorophyll. This is called chlorosis. Plant growth will slow down because the plant cannot photosynthesise fully.**

Identify which ion is deficient.

**nitrate**

Explain how this ion deficiency causes the condition in the diagram.

**Nitrate ions affect protein synthesis. They help a plant to convert the sugars made in photosynthesis into proteins needed for growth. This means if there isn't enough nitrate, the plant will have stunted growth.**

l

Name three physical defence responses that help a plant to defend against microorganisms.

1. **cellulose cell walls**
2. **Tough waxy cuticle on leaves.**
3. **Layers of dead cells around stems (bark on trees) which fall off.**

Give three ways to identify plant diseases.

1. **Reference a gardening manual or website.**
2. **Identify the pathogen in a laboratory.**
3. **Use a testing kit containing monoclonal antibodies.**

g

Name three mechanical adaptations that plants have to protect themselves against herbivores.

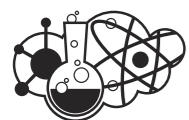
1. **Thorns and hairs to deter animals.**
2. **Leaves that droop or curl when touched.**
3. **Mimicry to trick animals.**

j

Name two chemical plant defence responses.

1. **antibacterial chemicals**
2. **poisons to deter herbivores**

m



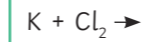
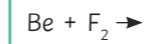
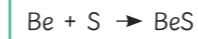
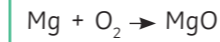
Draw and label an atom. Include labels for the following: neutron, proton, electron.

True or false?  
 1. The radius of an atom is 0.1nm  
 2. Most of the mass is in the shell of the atom.

What are the symbols for the following elements?

Element	Symbol
oxygen	
lithium	
sodium	
potassium	
helium	
carbon	
magnesium	

Complete and balance the following equations. What is the name of the compound formed?



**Mixtures**

Write the definition of a mixture. Give two examples.

Fill in the table to show the charges and mass of the components of an atom.

Name	Charge	Relative Mass
proton		
neutron		
electron		

What is the overall charge of an atom?  
 Positive  
 Negative  
 No charge

Complete the following diagram for sodium, include the atomic number and the atomic mass number.

Na

What is the mass number?  
 How do you calculate neutron number?

A compound is 2 or more \_\_\_\_\_, chemically \_\_\_\_\_.

Which of the following are compounds?  
 Put a ring round them.

oxygen, salt water, magnesium oxide, sodium chloride, nitrogen

Why have you circled the ones you have?

**Isotopes** are elements with a different number of \_\_\_\_\_ but the same number of \_\_\_\_\_, e.g. carbon 12 and carbon 14.

How can you use isotopes to calculate the relative atomic mass? Write down the equation.

Name the compounds and the elements they contain.

NaCl - \_\_\_\_\_

MgO - \_\_\_\_\_

MgS - \_\_\_\_\_

FeS - \_\_\_\_\_

What is the ratio of the elements in the following compounds?

e.g. CaO = 1:1

NaCl =

MgCl<sub>2</sub> =

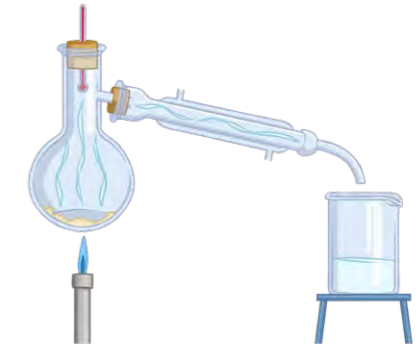
lithium fluoride =

K<sub>2</sub>O =

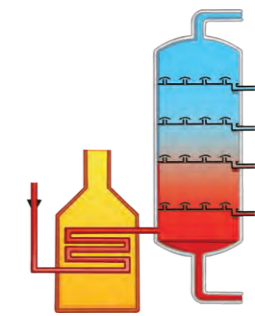
sodium hydroxide =

**Separating Mixtures**

What are the following separation techniques?



\_\_\_\_\_



\_\_\_\_\_

What separation technique would you use to separate out different inks in pens?

How can salt be collected using the process of crystallisation?

Sand and water can be separated by using a process called \_\_\_\_\_

Describe, in 4 steps, how to collect salt from rock salt.

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

Complete the electronic structure diagrams for:  
**oxygen**  
  
  
  
  
  
  
  
**magnesium**

**a** List 3 halogens  
 \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_  
  
 How many electrons do they have in their outer shell?  
  
  
 Describe how the reactivity changes as you go down the group.  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
  
 Write balanced symbol equations for the following reactions:  
 bromine + potassium iodide  
  
 chlorine + sodium iodide  
  
 fluorine + potassium chloride

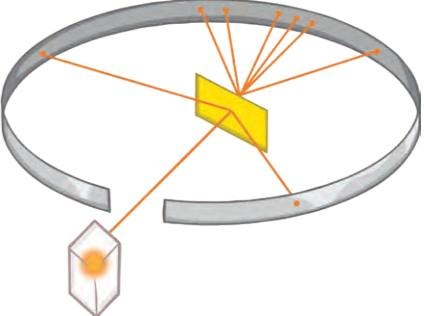
**d** Complete the following dot and cross diagrams for:  
**NaCl**  
  
  
  
  
  
**MgO**

**g** Describe the plum pudding model of the atom.  
 Draw a diagram.  
 \_\_\_\_\_  
 \_\_\_\_\_  
  
  
 Why did scientists believe this model?  
 \_\_\_\_\_

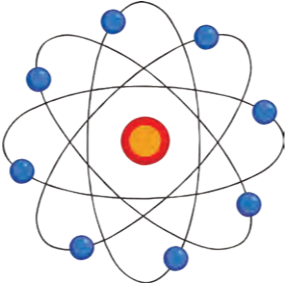
**b** Describe why the noble gases are so unreactive.  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
  
 The boiling points of the noble gases increase/decrease as you go down the group. (delete the wrong answer) Can you explain your answer?  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**e** Underline the properties of metals and circle the properties of non-metals:  
  
 Strong, low density, malleable, dull, good conductors of heat and electricity, high melting and boiling point, brittle, not good conductors of electricity.

**h** Complete word equations for the following reactions:  
 sodium + chlorine →  
 lithium + iodine →  
 potassium + bromine →

**k** Describe what the alpha scattering experiment showed scientists.  
  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**c** Describe what happens to the reactivity of the alkali metals as you go down the group.  
 \_\_\_\_\_  
  
 Why?  
 \_\_\_\_\_  
 \_\_\_\_\_  
  
 Complete the word and symbol equation for sodium reacting with water:  
 sodium + water → sodium hydroxide + \_\_\_\_\_  
 Na + \_\_\_\_\_ → NaOH + \_\_\_\_\_

**f** James Chadwick discovered the... (underline the correct answer)  
 proton  
 neutron  
 electron  


**i** How are the groups arranged in the periodic table?  
 \_\_\_\_\_  
 \_\_\_\_\_  
  
 How can you tell that the alkali metals are very reactive?  
 \_\_\_\_\_  
 \_\_\_\_\_  
  
 How can you tell the noble gases are unreactive?  
 \_\_\_\_\_  
 \_\_\_\_\_

**l** Niels Bohr discovered that  
 \_\_\_\_\_  
 \_\_\_\_\_  
  
 Why did Mendeleev leave gaps in the periodic table?  
 \_\_\_\_\_  
 \_\_\_\_\_  
  
 What happened to some of the gaps he left?  
 \_\_\_\_\_  
 \_\_\_\_\_

The **transition** elements are a group of metals with similar properties which are different to the metals in group 1. Shade in the transition metals on the periodic table below.

Name three common transition metals.

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Complete the sentences below to describe the properties of transition metals.

They form \_\_\_\_\_ compounds when reacting.

They are \_\_\_\_\_ of heat and electricity. They are malleable. They have \_\_\_\_\_ densities.

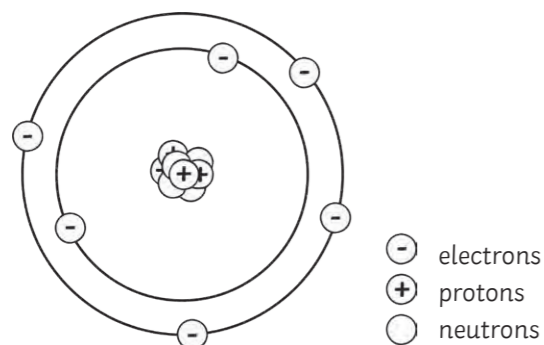
Compared to the alkali metals, they are \_\_\_\_\_ reactive.

Complete the table to show the ions and colours formed by iron compounds. iron (III) oxide

Compound Name	Ion	Colour
iron (II) hydroxide	$\text{Fe}^{2+}$	_____
_____	$\text{Fe}^{3+}$	_____
iron (III) oxide	_____	_____



Draw and label an atom. Include labels for the following: neutron, proton, electron.



True or false?

- The radius of an atom is 0.1nm **True**
- Most of the mass is in the shell of the atom. **False, most of the mass is in the centre**

Fill in the table to show the charges and mass of the components of an atom.

Name	Charge	Relative Mass
proton	+1	1
neutron	0	1
electron	-1	very small

What is the overall charge of an atom?

**No charge**

A compound is 2 or more **elements**, chemically **joined**.

Which of the following are compounds?

Put a ring round them.

oxygen, salt water, **magnesium oxide**, **sodium chloride**, nitrogen

Why have you circled the ones you have?

**They have two or more elements in their chemical name/chemical formula.**

What are the symbols for the following elements?

Element	Symbol
oxygen	<b>O</b>
lithium	<b>Li</b>
sodium	<b>Na</b>
potassium	<b>K</b>
helium	<b>He</b>
carbon	<b>C</b>
magnesium	<b>Mg</b>

Complete the following diagram for sodium, include the atomic number and the atomic mass number.

23 mass number

**Na**

11 atomic number

What is the mass number?

**Total number of protons and neutrons.**

How do you calculate neutron number?

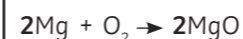
**Atomic mass – proton number**

**Isotopes** are elements with a different number of **neutrons** but the same number of **protons**, e.g. carbon 12 and carbon 14.

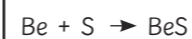
How can you use isotopes to calculate the relative atomic mass? Write down the equation.

$$A_r = \frac{\text{sum of (isotope abundance} \times \text{isotope mass number)}}{\text{sum of abundances of all the isotopes.}}$$

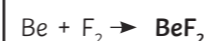
Complete and balance the following equations. What is the name of the compound formed?



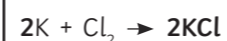
**magnesium oxide**



**beryllium sulphide**



**beryllium fluoride**



**potassium chloride**

**Mixtures**

Write the definition of a mixture. Give two examples.

**Two or more elements together, not chemically joined and can be easily separated.**

**Salt water, sand and water**

Name the compounds and the elements they contain.

NaCl - **sodium chloride, sodium and chlorine**

MgO - **magnesium oxide, magnesium and oxygen**

MgS - **magnesium sulfide, magnesium and sulfur**

FeS - **iron sulfide, iron and sulfur**

What is the ratio of the elements in the following compounds?

e.g. CaO = 1:1

NaCl = 1:1

MgCl<sub>2</sub> = 1:2

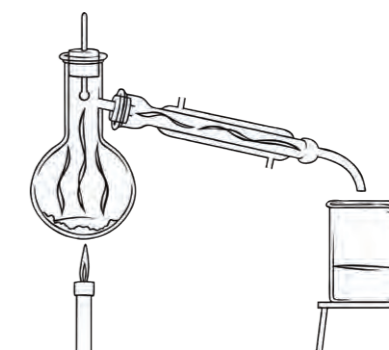
lithium fluoride = 1:1

K<sub>2</sub>O = 2:1

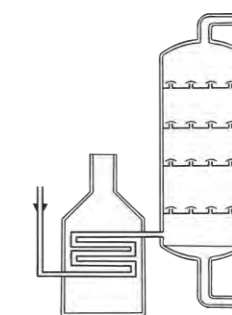
sodium hydroxide = 1:1:1

**Separating Mixtures**

What are the following separation techniques?



**Distillation**



**Fractional distillation**

What separation technique would you use to separate out different inks in pens?

**Chromatography**

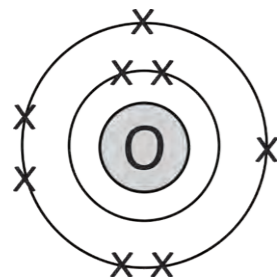
How can salt be collected using the process of crystallisation?  
**By heating up a mixture of salt and water, the water will evaporate and leave the salt in the bowl.**

Sand and water can be separated by using a process called **filtration**.

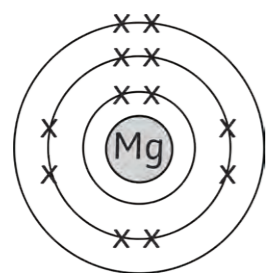
Describe, in 4 steps, how to collect salt from rock salt.

- Grind the mixture;**
- Add water and stir;**
- Filter the mixture;**
- Evaporate the salt water and salt is left over.**

Complete the electronic structure diagrams for:  
oxygen



magnesium



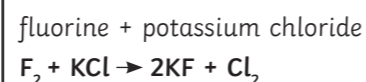
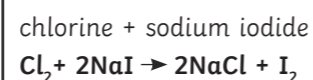
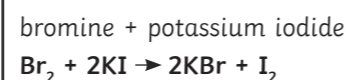
List 3 halogens  
chlorine, fluorine, iodine, astatine

How many electrons do they have in their outer shell?  
7 electrons

Describe how the reactivity changes as you go down the group.

**They become less reactive, the atom becomes larger because there are more electron shells, further from the nucleus so the pull of the nucleus is less. So the electron is less likely to be gained as there is less of a positive pull.**

Write balanced symbol equations for the following reactions:



Underline the properties of metals and circle the properties of non-metals:

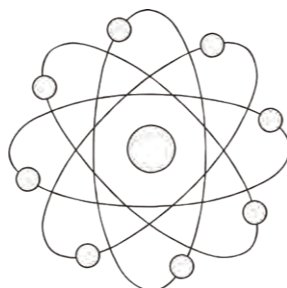
Strong, low density, malleable, dull, good conductors of heat and electricity, high melting and boiling point, brittle, not good conductors of electricity

James Chadwick discovered the...  
(underline the correct answer)

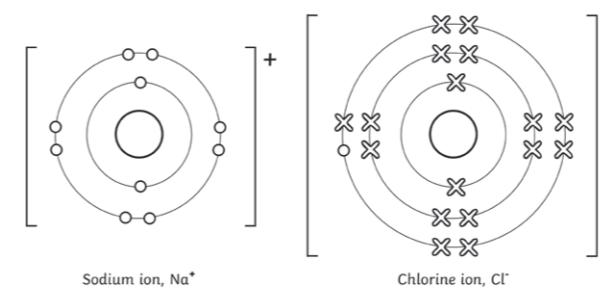
proton

neutron

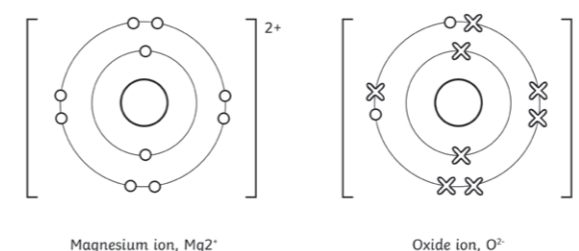
electron



Complete the following dot and cross diagrams for:  
NaCl

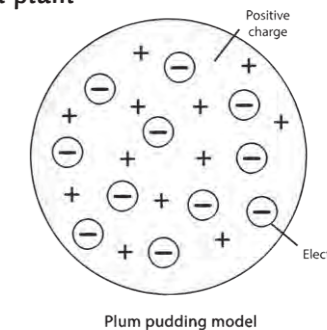


MgO



Describe the plum pudding model of the atom.  
Draw a diagram.

**A sphere of positive charge with electrons dotted about; looking like a plum pudding.**



Why did scientists believe this model?  
**Lack of experimental evidence.**

Describe why the noble gases are so unreactive.  
**Their outer shell is full of electrons.**

The boiling points of the noble gases **increase** as you go down the group.  
**This is because there are more forces to bond the atoms together, therefore more energy is required to break the bonds.**

Describe what happens to the reactivity of the alkali metals as you go down the group.

**It increases**

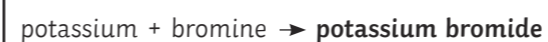
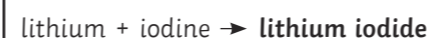
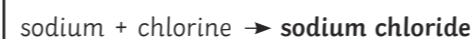
Why?

**The number of electrons increases. They are further away from the nucleus. There is less pull on the outer electrons so the atom is more likely to lose an electron.**

Complete the word and symbol equation for sodium reacting with water:



Complete word equations for the following reactions:



How are the groups arranged in the periodic table?  
**According to their properties.**

How can you tell that the alkali metals are very reactive?  
**According to their properties.**

How can you tell the noble gases are unreactive?  
**Full shell of outer electrons.**

Describe what the alpha scattering experiment showed scientists.

**Most alpha particles go straight through, some are scattered, some rebound off the gold foil. This shows that the nucleus of an atom has a very small radius. Most of the mass is concentrated in the nucleus.**

Niels Bohr discovered that  
**electrons orbit the nucleus in shells.**

Why did Mendeleev leave gaps in the periodic table?  
**He knew that the elements existed but they hadn't been found, based on their mass.**

What happened to some of the gaps he left?  
**They have been filled. Scientists have found some of the elements.**

The **transition** elements are a group of metals with similar properties which are different to the metals in group 1. Shade in the transition metals on the periodic table below.

Name three common transition metals.

Students may name some of the following: chromium, manganese, iron, cobalt, nickel, copper or any other transition metal.

Complete the sentences below to describe the properties of transition metals.

They form **coloured** compounds when reacting. They are **conductors** of heat and electricity. They are malleable. They have **high** densities.

Compared to the alkali metals, they are **less** reactive.

Complete the table to show the ions and colours formed by iron compounds. iron (III) oxide

Compound Name	Ion	Colour
iron (II) hydroxide	$\text{Fe}^{2+}$	pale green
iron (III) hydroxide	$\text{Fe}^{3+}$	orange-brown
iron (III) oxide	$\text{Fe}^{3+}$	red-brown



**a**

The three types of chemical bonding are...

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

Describe the movement and arrangement of subatomic particles in each of the above.

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

**d**

Using this example, draw dot and cross diagrams for H<sub>2</sub>O, NH<sub>3</sub> and O<sub>2</sub>

- H<sub>2</sub>O
- NH<sub>3</sub>
- O<sub>2</sub>

**f**

Complete the polymer diagram for the following monomer.

What is a monomer?  
\_\_\_\_\_

What is a polymer?  
\_\_\_\_\_

**h**

Match up the following with the state symbol.

solid	(g)
liquid	(l)
gas	(s)
solution	(aq)

What happens to the intermolecular forces when a liquid turns into a gas?  
\_\_\_\_\_

**b**

Draw a dot and cross diagram for the following ionic bonding:  
sodium chloride

Which four groups are more likely to make ions?  
\_\_\_\_\_

**e**

Describe how metals conduct heat and electricity. Use the diagram to help explain.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**g**

Properties of metals and alloys.

Describe how the 2 pictures are different to each other.  
\_\_\_\_\_

Why are some alloys harder than pure metals?  
\_\_\_\_\_

**i**

Describe the changes of state during:

evaporation:  
\_\_\_\_\_

condensation:  
\_\_\_\_\_

melting:  
\_\_\_\_\_

**c**

Describe the bonding in ionic compounds

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Why can ionic compounds conduct electricity when in solution?  
\_\_\_\_\_

**j**

Small molecules form substances with **high/low** boiling points because they have **strong/weak** intermolecular forces.

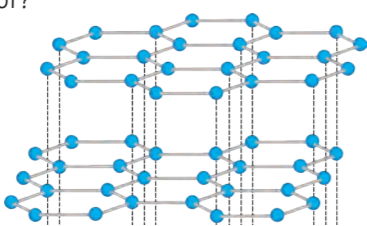
They **do/do not** conduct electricity because they do not have any free electrons.

a Draw a diagram of the structure of diamond.

Why is this structure so strong? Choose the correct answer.

1. Many strong ionic bonds.
2. Many strong covalent bonds.
3. Many strong metallic bonds.

b What is this a diagram of?



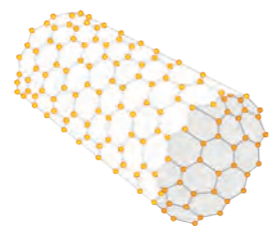
Explain why it can conduct electricity and heat.

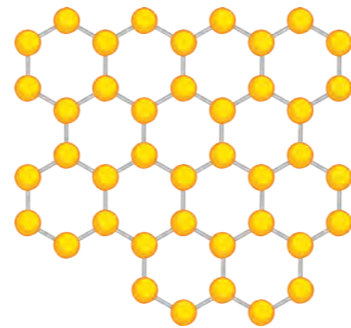
c What is **nanoscience**?

d Why do the properties of a material made from nanoparticles change when it is in bulk?

e This is a carbon \_\_\_\_\_.

It has high \_\_\_\_\_ strength, high \_\_\_\_\_ and \_\_\_\_\_ conductivity.

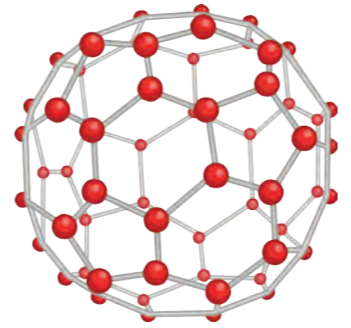


f 

\_\_\_\_\_ is a single layer of graphite.

Why is this material so strong?

Where is this product used?

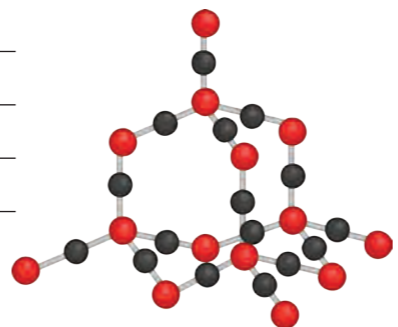
g 

What is this structure?

How many carbon atoms are there?

a) 20    b) 30    c) 40    d) 50    e) 60

h Explain the differences and similarities between silicon dioxide and diamond.



i What are the formulas for the following?  
Match up the answers.

Iron (II) oxide	$\text{Fe}(\text{OH})_2$
Iron (II) hydroxide	$\text{FeO}$
Iron (III) oxide	$\text{Fe}_2\text{O}_3$

j How many:  
mm in 1m? \_\_\_\_\_  
m in 1mm? \_\_\_\_\_

What are the abbreviated units for the following:  
metre; \_\_\_\_\_  
centimetre; \_\_\_\_\_  
millimetre; \_\_\_\_\_  
nanometre; \_\_\_\_\_  
micrometre. \_\_\_\_\_

k Compare diamond and graphite.  
Describe the structure, hardness and conductivity.

l Name **four** uses of nanoparticles.

m Explain why nanoparticles can be potentially harmful to human health.

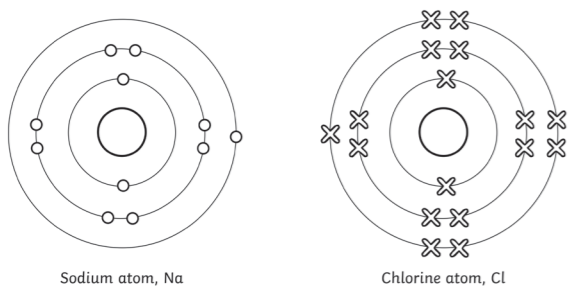
The three types of chemical bonding are...

1. ionic
2. covalent
3. metallic

Describe the movement and arrangement of subatomic particles in each of the above.

1. Electrons are lost and gained to fill the outer shell.
2. Electrons are shared to fill the outer shell.
3. Positive metal ions are surrounded by free electrons.

Draw a dot and cross diagram for the following ionic bonding:  
sodium chloride



Which four groups are more likely to make ions?

1, 2, 6 and 7

Describe the bonding in ionic compounds

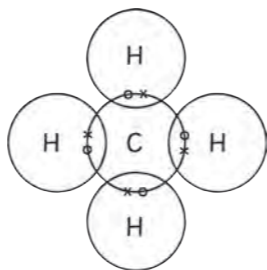
**They are held together by the strong ionic forces of oppositely charged ions. Metal ions have a positive charge and non-metals ions have a negative charge so they are attracted. They have very strong bonds.**

Why can ionic compounds conduct electricity when in solution?

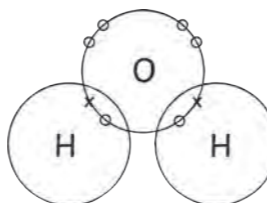
**The ions are free to move about and can conduct electricity.**

Using this example, draw dot and cross diagrams for H<sub>2</sub>O, NH<sub>3</sub> and O<sub>2</sub>

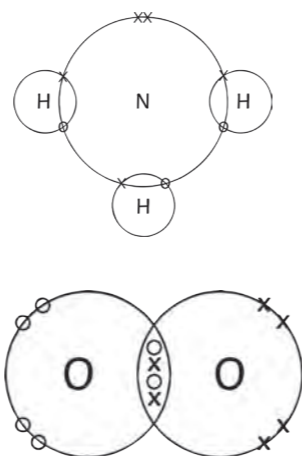
1. H<sub>2</sub>O



2. NH<sub>3</sub>



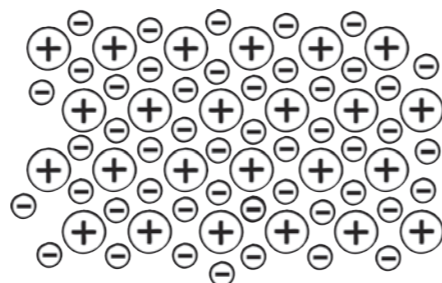
3. O<sub>2</sub>



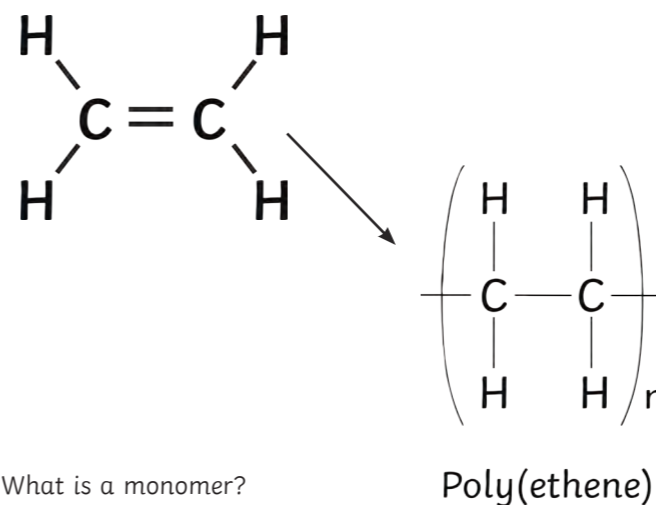
Describe how metals conduct heat and electricity.

Use the diagram to help explain.

**Metals have free electrons that are able to move around and transfer energy.**



Complete the polymer diagram for the following monomer.



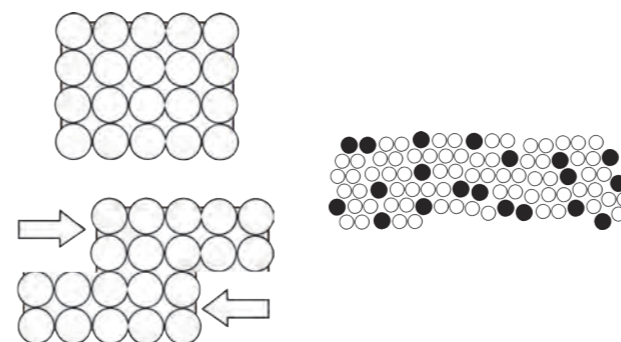
What is a monomer?

**One molecule.**

What is a polymer?

**A long chain of monomers.**

Properties of metals and alloys.



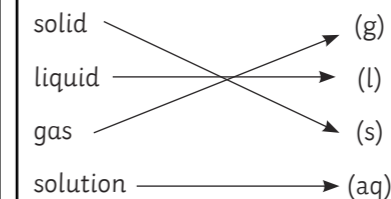
Describe how the 2 pictures are different to each other.

**Alloys have different sized particles. In pure metals, all the atoms are the same.**

Why are some alloys harder than pure metals?

**They have different sized particles so the layers can not slide across each other as easily.**

Match up the following with the state symbol.



What happens to the intermolecular forces when a liquid turns into a gas?

**The forces of attraction become less as the particles gain energy and move about more.**

Describe the changes of state during:

evaporation:

**liquid changes to a gas.**

condensation:

**gas changes to a liquid.**

melting:

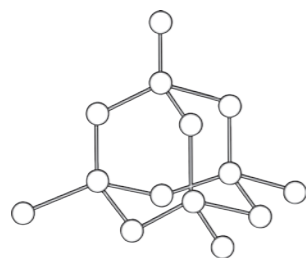
**solid changes to a liquid.**

Small molecules form substances with **low** boiling points because they have **weak** intermolecular forces.

They **do not** conduct electricity because they do not have any free electrons.



Draw a diagram of the structure of diamond.

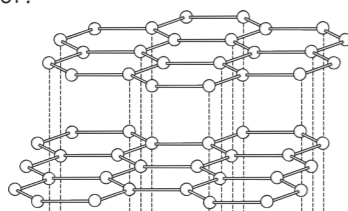


Why is this structure so strong? Choose the correct answer.

- Many strong ionic bonds.
- Many strong covalent bonds.**
- Many strong metallic bonds.

What is this a diagram of?

**Graphite**



Explain why it can conduct electricity and heat.

**Graphite has free delocalised electrons that can pass between layers; the electrons can carry the charge.**

What is **nanoscience**?

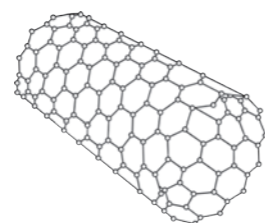
**The study of very small particles: 1 to 100nm diameter.**

Why do the properties of a material made from nanoparticles change when it is in bulk?

**This is because of the high surface area to volume ratio.**

This is a carbon **nanotube**.

It has high **tensile** strength, high **heat** and **electrical** conductivity.



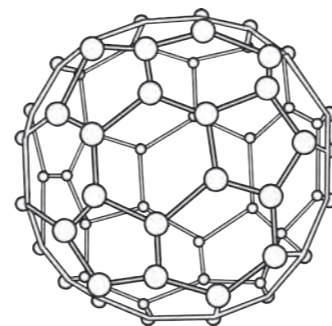
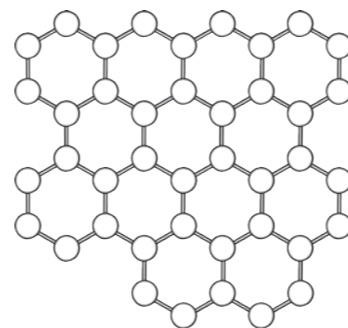
**Graphene** is a single layer of graphite.

Why is this material so strong?

**It has strong covalent bonds.**

Where is this product used?

**In electronics and composites. \_**



What is this structure?

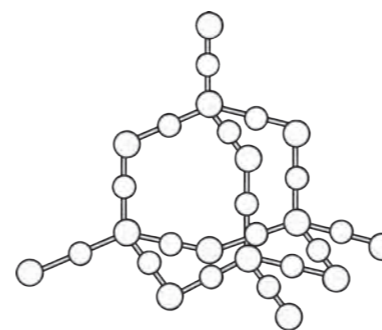
**Buckminsterfullerene**

How many carbon atoms are there?

**e) 60**

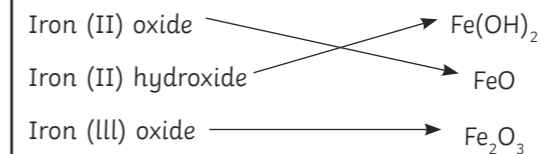
Explain the differences and similarities between silicon dioxide and diamond.

**Silicon dioxide contains silicon and oxygen atoms instead of carbon but has a similar structure to diamond.**



What are the formulas for the following?

Match up the answers.



How many:

mm in 1m? **1000mm**

m in 1mm? **0.001m**

What are the abbreviated units for the following:

metre; **m**

centimetre; **cm**

millimetre; **mm**

nanometre; **nm**

micrometre. **µm**

Compare diamond and graphite.

Describe the structure, hardness and conductivity.

**Both – forms of carbon.**

**Single covalent bonds**

**Have many atoms.**

**Graphite – flat sheets, conducts electricity, each carbon atom forms 3 covalent bonds.**

**Diamond – tetrahedral structure, each carbon atom forms 4 covalent bonds, does not conduct electricity.**

Name **four** uses of nanoparticles.

**Two from: medicine, electronics, cosmetics, sun creams, deodorants, catalysts.**

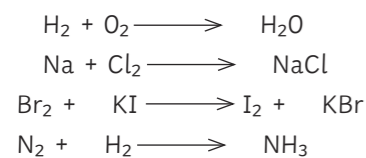
Explain why nanoparticles can be potentially harmful to human health.

**The properties of nanoparticles are different to the properties of the same material in bulk. It is difficult for scientists to know how they will behave through studying the material that the nanoparticle has come from.**



Mass of the \_\_\_\_\_ must always equal the mass of the \_\_\_\_\_.

Balance the following:



Complete the following sentences

The relative formula mass is the (\_\_\_\_) of a compound.

It is the sum of the \_\_\_\_\_ atomic masses ( $A_r$ ) of the atoms.

Calculate the relative formula mass for the following. Show your working out.

$A_r$  of C = 12  
 $A_r$  of H = 1  
 $A_r$  of O = 16  
 $A_r$  of N = 14

Example:

$$\begin{array}{l} \text{CO}_2 \\ 12 + (16 \times 2) \\ 12 + 32 \\ = 44 \end{array}$$

$\text{H}_2\text{O}$

$\text{CH}_4$

$\text{NH}_4\text{NO}_3$

When a gas is produced during a reaction, why might the mass go down?

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---



---

Write the equation for when magnesium reacts with oxygen.

---

What happens to the mass of the product from the question above?

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---



---

$$\% \text{ mass} = \frac{A_r \times \text{number of atoms}}{M_r \text{ of the compound}} \times 100$$

Using the equation above, calculate the % mass of sodium (Na) in NaCl.

$A_r$  of Na = 23

$A_r$  of Cl = 35.5

Use the  $A_r$  values below to calculate the molar mass of these elements. Don't forget the units.

E.g.  $A_r$  of sodium = 23, one mole = 23g

$A_r$  of K = 39

$A_r$  of F = 19

$A_r$  of O = 16

$A_r$  of Mg = 24

potassium

fluorine ( $\text{F}_2$ )

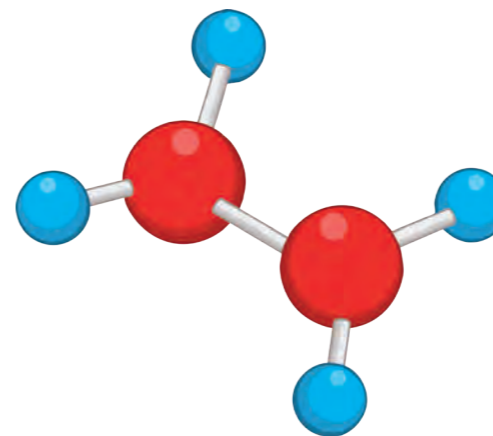
oxygen ( $\text{O}_2$ )

magnesium

What is the equation to calculate the number of moles for a pure substance.

moles = \_\_\_\_\_

Rearrange the equation to calculate the mass.

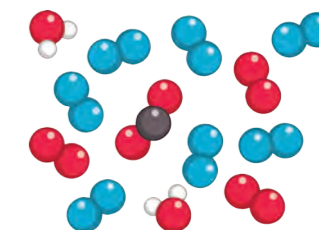


What unit are chemical amounts measured in?

1. cm
2. m/s
3. moles

Avogadro's constant is...

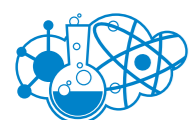
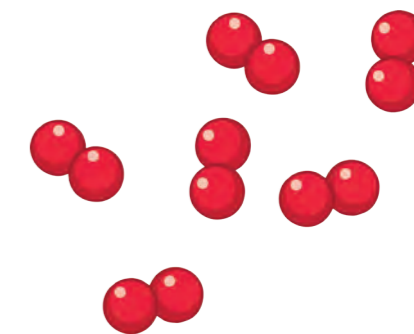
1.  $6.03 \times 10^{23}$  per mole
2.  $6.02 \times 10^{23}$  per mole
3.  $6.05 \times 10^{23}$  per mole



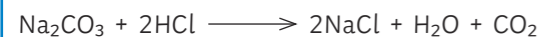
What mass of nitrogen is in 92g of  $\text{NO}_2$ ?

$A_r$  of N = 14

$A_r$  of O = 16



Using the equation



What mass of NaCl would be produced from 2.5 grams of sodium carbonate?

$A_r$  of Na = 23

$A_r$  of H = 1

$A_r$  of Cl = 35.5

$A_r$  of O = 16

$A_r$  of C = 12

What is the mass of solute when the concentration of a solution is  $4\text{g/dm}^3$  and the volume is  $600\text{cm}^3$ ?

$$\text{concentration (gm/dm}^3\text{)} = \frac{\text{mass of solute}}{\text{volume}}$$

Using the equation above, calculate the following:

The mass of a solute is 60g and the volume is  $0.5\text{dm}^3$ , what is the concentration?

Rearrange the following equation to find volume.

$$\text{concentration (mol/dm}^3\text{)} = \frac{\text{mass of solute}}{\text{volume}}$$

Why, in some reactions, are the reactants in excess?

To make sure that the reaction has completely finished and the other reactant has been completely used up.

Define concentration.

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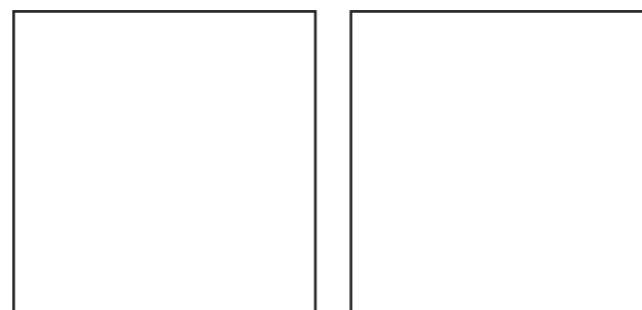


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Draw a diagram to show a solution with a low concentration and a solution with a high concentration



Convert the following measurements in  $\text{cm}^3$  to  $\text{dm}^3$ .

- $15\text{cm}^3$
- $60\text{cm}^3$
- $90\text{cm}^3$
- $0.5\text{cm}^3$

When a chemical reaction occurs, the amount of product made is not always equal to the amount calculated. Explain why.

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The amount of a product obtained from a reaction is called the \_\_\_\_\_. The actual yield is compared to the maximum expected amount as a percentage. This is called the \_\_\_\_\_.

Complete the equation below:

$$\% \text{ yield} = \frac{\text{actual mass of product}}{\text{expected mass of product}} \times \text{_____}$$

A chemist carried out a reversible reaction. She had expected to make 14.50kg of product, but only obtained 12.75kg. Calculate the percentage yield.

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What is atom economy?

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The equation below is used to calculate the \_\_\_\_\_ of a reaction.

$$\frac{\text{relative formula mass of desired product}}{\text{sum of relative formula masses of all reactants}} \times 100$$



In the reaction above, calcium oxide is a useful product and carbon dioxide is a waste product.

Calculate the atom economy of the reaction.

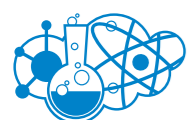
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a You are asked to prepare 100cm<sup>3</sup> of sodium hydroxide solution (NaOH) with a concentration of 0.5mol dm<sup>-3</sup>. Calculate the amount of solute in grams. Show your working.

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b What is the name of this piece of equipment?

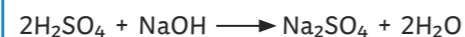



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Name three other pieces of equipment required to carry out a titration reaction.

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c A titration was carried out and 25.00cm<sup>3</sup> sulfuric acid was reacted with 2.0mol/dm<sup>3</sup> sodium hydroxide. 34.00cm<sup>3</sup> sodium hydroxide was required to neutralise the sulfuric acid. Calculate the concentration of sulfuric acid in mol/dm<sup>3</sup>.




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d The volume of one mole of any gas at room temperature and pressure (20°C and 1 atmosphere pressure) is \_\_\_\_\_.

e Calculate the volume of 0.25mol carbon dioxide at room temperature (rtp) using this equation:  
volume of gas at rtp = number of moles × 24

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Calculate the number of moles of hydrogen which occupy 9dm<sup>3</sup> at rtp.

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f I understand the following topic:

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I need to work on the following topic:

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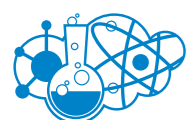
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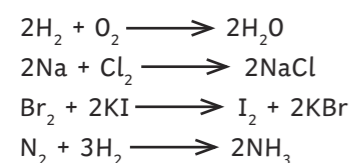


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Mass of the product must always equal the mass of the reactants.

Balance the following:



Complete the following sentences

The relative formula mass is the ( $M_r$ ) of a compound.

It is the sum of the relative atomic masses ( $A_r$ ) of the atoms.

Calculate the relative formula mass for the following. Show your working out.

$A_r$  of C = 12  
 $A_r$  of H = 1  
 $A_r$  of O = 16  
 $A_r$  of N = 14

Example:

$\text{CO}_2$   
 $12 + (16 \times 2)$   
 $12 + 32$   
 $= 44$

$\text{H}_2\text{O}$   
 $(1 \times 2) + 16$   
 $2 + 16$   
 $= 18$

$\text{CH}_4$   
 $12 + (1 \times 4)$   
 $12 + 4$   
 $= 16$

$\text{NH}_4\text{NO}_3$   
 $14 + (1 \times 4) + 14 + (16 \times 3)$   
 $14 + 4 + 14 + 48$   
 $= 80$

When a gas is produced during a reaction, why might the mass go down?

The gas may be released into the environment.

Write the equation for when magnesium reacts with oxygen.



What happens to the mass of the product from the question above?

The mass increases because oxygen is added from the environment.

$$\% \text{ mass} = \frac{A_r \times \text{number of atoms} \times 100}{M_r \text{ of the compound}}$$

Using the equation above, calculate the % mass of sodium (Na) in NaCl.

$A_r$  of Na = 23

$A_r$  of Cl = 35.5

$$\% \text{ mass} = \frac{23 \times 1 \times 100}{23 + 35.5}$$

$$= \frac{2300}{58.5}$$

$$= 39.3\% \text{ (to 1d.p.)}$$

Use the  $A_r$  values below to calculate the molar mass of these elements. Don't forget the units.

E.g.  $A_r$  of sodium = 23, one mole = 23g

$A_r$  of K = 39

$A_r$  of F = 19

$A_r$  of O = 16

$A_r$  of Mg = 24

potassium ( $39 \times 1$ ) 39g/mol

fluorine ( $19 \times 2$ ) 38g/mol

oxygen ( $16 \times 2$ ) 32g/mol

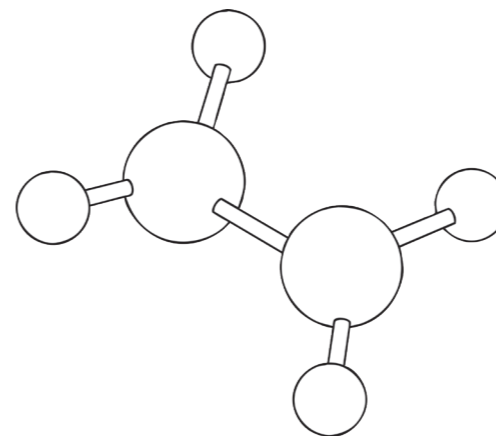
magnesium ( $24 \times 1$ ) 24g/mol

What is the equation to calculate the number of moles for a pure substance.

$$\text{moles} = \frac{\text{mass in g}}{M_r}$$

Rearrange the equation to calculate the mass.

$$\text{mass} = \text{moles} \times M_r$$

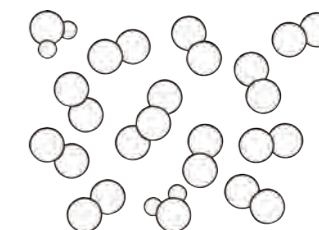


What unit are chemical amounts measured in?

- cm
- m/s
- moles

Avogadro's constant is...

- $6.03 \times 10^{23}$  per mole
- $6.02 \times 10^{23}$  per mole
- $6.05 \times 10^{23}$  per mole



What mass of nitrogen is in 92g of  $\text{NO}_2$ ?

$A_r$  of N = 14

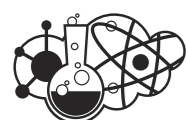
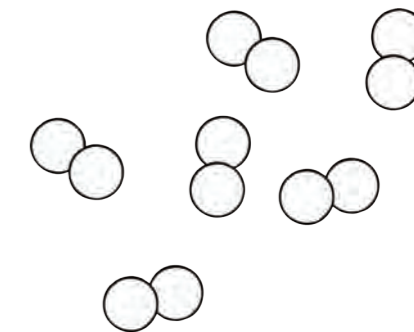
$A_r$  of O = 16

$$M_r = 14 + (16 \times 2) = 46$$

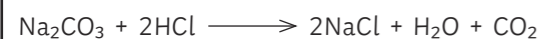
N = 14

$$\frac{14}{46} = 0.304$$

$$0.304 \times 92 = 28\text{g}$$



Using the equation



What mass of NaCl would be produced from 2.5 grams of sodium carbonate?

$$A_r \text{ of Na} = 23$$

$$A_r \text{ of H} = 1$$

$$A_r \text{ of Cl} = 35.5$$

$$A_r \text{ of O} = 16$$

$$A_r \text{ of C} = 12$$

$$M_r \text{ of NaCl} = 58.5$$

$$M_r \text{ of Na}_2\text{CO}_3 = 106$$

$$\frac{2.5}{106} = 0.0236 \text{ moles (to 3 significant figures)}$$

$$0.0236 \times 2 = 0.0472 \text{ (1:2 ratio)}$$

$$0.0472 \times 58.5 = 2.76 \text{ grams of NaCl}$$

What is the mass of solute when the concentration of a solution is  $4\text{g/dm}^3$  and the volume is  $600\text{cm}^3$ ?

$$\text{Convert } 600\text{cm}^3 \text{ to } \text{dm}^3 = 0.6\text{dm}^3$$

$$\text{mass} = \text{concentration} \times \text{volume}$$

$$4 \times 0.6\text{dm}^3 = 2.4\text{g}$$

$$\text{concentration (gm/dm}^3\text{)} = \frac{\text{mass of solute}}{\text{volume}}$$

Using the equation above, calculate the following:

The mass of a solute is 60g and the volume is  $0.5\text{dm}^3$ , what is the concentration?

$$\begin{aligned} \text{Concentration} &= \frac{60}{0.5} \\ &= 120\text{g/dm}^3 \end{aligned}$$

Rearrange the following equation to find volume.

$$\text{concentration (mol/dm}^3\text{)} = \frac{\text{mass of solute}}{\text{volume}}$$

$$\text{volume} = \frac{\text{mass of solute}}{\text{concentration}}$$

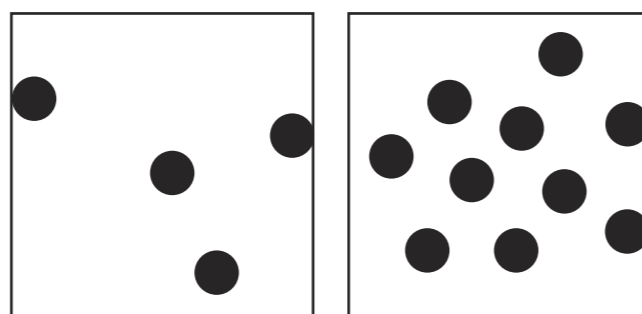
Why, in some reactions, are the reactants in excess?

To make sure that the reaction has completely finished and the other reactant has been completely used up.

Define concentration.

The amount of a substance in a certain volume of a solution is called its concentration.

Draw a diagram to show a solution with a low concentration and a solution with a high concentration



Convert the following measurements in  $\text{cm}^3$  to  $\text{dm}^3$ .

1.  $15\text{cm}^3$

2.  $60\text{cm}^3$

3.  $90\text{cm}^3$

4.  $0.5\text{cm}^3$

Divide by 1000

1.  $0.015\text{dm}^3$

2.  $0.06\text{dm}^3$

3.  $0.09\text{dm}^3$

4.  $0.0005\text{dm}^3$

When a chemical reaction occurs, the amount of product made is not always equal to the amount calculated. Explain why.

Some of the product is lost when it is being collected from the reacting mixture. Not all the reactants make products because the reaction is reversible. Some reactants may react differently to what is expected.

The amount of a product obtained from a reaction is called the yield. The actual yield is compared to the maximum expected amount as a percentage. This is called the percentage yield.

Complete the equation below:

$$\% \text{ yield} = \frac{\text{actual mass of product made}}{\text{expected mass of product}} \times 100$$

A chemist carried out a reversible reaction. She had expected to make 14.50kg of product, but only obtained 12.75kg. Calculate the percentage yield.

$$(12.75 \div 14.50) \times 100 = 87.93\%$$

What is atom economy?

A measure of how many starting atoms are used to make the useful products.

The equation below is used to calculate the atom economy of a reaction.

$$\frac{\text{relative formula mass of desired product}}{\text{sum of relative formula masses of all reactants}} \times 100$$



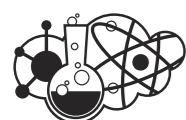
In the reaction above, calcium oxide is a useful product and carbon dioxide is a waste product.

Calculate the atom economy of the reaction.

$$\text{RFM of calcium oxide: } 40 + 16 = 56$$

$$\text{RFM of carbon dioxide: } 12 + (16 \times 2) = 44$$

$$(56 \div (56 + 44)) \times 100 = 56\%$$



a You are asked to prepare 100cm<sup>3</sup> of sodium hydroxide solution (NaOH) with a concentration of 0.5mol dm<sup>-3</sup>. Calculate the amount of solute in grams.

Show your working.

$$\text{amount in mol} = \text{volume in dm}^3 \times \text{concentration in mol/dm}^3$$

$$\text{volume} = 100\text{cm}^3 \div 1000 = 0.1\text{dm}^3$$

$$= 0.1 \times 0.5 = 0.05\text{mol}$$

$$\text{RFM of NaOH: } 22 + 16 + 1 = 39$$

$$0.05\text{mol} \times 39 = 1.95\text{g}$$

b What is the name of this piece of equipment?

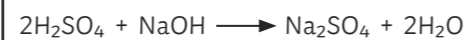


burette

Name three other pieces of equipment required to carry out a titration reaction.

conical flask, pipette filler, pipette

c A titration was carried out and 25.00cm<sup>3</sup> sulfuric acid was reacted with 2.0mol/dm<sup>3</sup> sodium hydroxide. 34.00cm<sup>3</sup> sodium hydroxide was required to neutralise the sulfuric acid. Calculate the concentration of sulfuric acid in mol/dm<sup>3</sup>.



volume of acid: 25.00cm<sup>3</sup>, concentration of acid: ?

volume of alkali: 34.00cm<sup>3</sup>, concentration of alkali: 2.0mol/dm<sup>3</sup>

$$\text{volume of acid: } 25.00\text{cm}^3 \div 1000 = 0.025\text{dm}^3$$

$$\text{volume of alkali: } 34.00\text{cm}^3 \div 1000 = 0.034\text{dm}^3$$

amount in mol = volume in dm<sup>3</sup> × concentration in mol/dm<sup>3</sup>

$$\text{amount in mol (alkali): } 0.034 \times 2.0 = 0.068\text{mol}$$

from the equation: 1mol alkali (NaOH) : 2mol acid (2H<sub>2</sub>SO<sub>4</sub>)

$$\text{amount in mol (acid): } 0.068\text{mol} \times 2 = 0.136\text{mol}$$

concentration in mol/dm<sup>3</sup> = amount in mol ÷ volume in dm<sup>3</sup>

$$0.136 \div 0.025 = 5.44\text{mol/dm}^3$$

d The volume of one mole of any gas at room temperature and pressure (20°C and 1 atmosphere pressure) is 24dm<sup>3</sup>.

e Calculate the volume of 0.25mol carbon dioxide at room temperature (rtp) using this equation:

volume of gas at rtp = number of moles × 24

$$\text{volume} = 0.25 \times 24 = 6\text{dm}^3$$

Calculate the number of moles of hydrogen which occupy 9dm<sup>3</sup> at rtp.

$$\text{moles} = \text{volume} \div 24$$

$$\text{moles} = 9 \div 24 = 0.375\text{mol}$$

f I understand the following topic:

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I need to work on the following topic:

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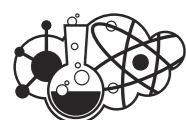
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Describe what a system is.

a

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Describe energy store changes for the following objects:

b



A football that has been kicked upwards.

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A squash ball hitting a wall.

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A car accelerating.

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A car decelerating.

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Bringing water to the boil.

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What is the equation linking kinetic energy, mass and speed?

c

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Write the units for the following:

kinetic energy: \_\_\_\_\_

mass: \_\_\_\_\_

speed: \_\_\_\_\_

List some examples of objects with kinetic energy stores.

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What is the equation linking elastic potential energy, spring constant and extension?

d

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Write the units for the following:

elastic potential energy: \_\_\_\_\_

spring constant: \_\_\_\_\_

extension: \_\_\_\_\_

List some examples of objects with elastic potential energy stores.

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What is the equation linking gravitational potential energy, mass, gravitational field strength and height?

e

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Write the units for the following:

gravitational potential energy: \_\_\_\_\_

mass: \_\_\_\_\_

gravitational field strength: \_\_\_\_\_

height: \_\_\_\_\_

List some examples of objects that have gravitational potential energy stores.

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What is the equation linking change in thermal energy, mass, specific heat capacity and temperature change?

f

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Write the units for the following:

change in thermal energy: \_\_\_\_\_

specific heat capacity: \_\_\_\_\_

Write a definition for specific heat capacity.

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Define Power.

g

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Write a definition for specific heat capacity.

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Write the units for the following:

power: \_\_\_\_\_

energy transferred: \_\_\_\_\_

time: \_\_\_\_\_

work done: \_\_\_\_\_

An LED bulb has a power rating of 8W, a halogen bulb has a power rating of 28W but they both have a similar brightness. What is the difference?

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The power output of a hairdryer is 2000W. How much energy is transferred per second?

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a What is the law of conservation of energy?

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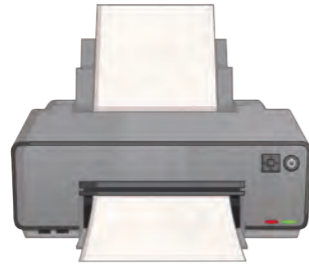
Define dissipation.

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b The following questions are about energy stores and transfers in a printer.



The printer transfers energy from the chemical energy in the power station to the moving parts of the printer. How is the energy transferred from the power station to the printer? \_\_\_\_\_

What is the final energy store? \_\_\_\_\_

Some of the energy to the printer is transferred to the surroundings. This energy is wasted. How is the energy transferred to the surroundings? \_\_\_\_\_

What is the final energy store? \_\_\_\_\_

c For the following situations, suggest methods to reduce unwanted energy transfers and what the unwanted energy transfers are.  
Hot water stored in a tank.

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Moving parts in a car.

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d Describe how thermal conductivity of a material affects how it transfers energy by conduction.

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e How is energy lost from a building? What factors affect this?




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f What is the equation linking efficiency, useful output energy transfer and total input energy transfer?

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What is the equation linking efficiency, useful power output and total power input?

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When energy is transferred in a closed system, what happens to the total amount of energy?

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How can the efficiency of an energy transfer be increased?

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g Which lorry is more energy efficient and why?




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h List the main energy resources.

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i Define renewable and non-renewable energy resources.

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j For the energy resources that you have listed, write an R next to those that are renewable and N next to those that are non-renewable.

Except for oil, all energy resources are used for electricity generation. Which are used for heating?

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k My main areas for improvement are:

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Energy Resource	Enviromental Impact	Reliability of Output
Coal		
Oil		
Gas		
Nuclear		
Biofuel		
Wind		
Hydroelectricity		
Geothermal		
Tidal		
Waves		
Solar		

Describe what a system is.

**It is an object or group of objects.**

a

Describe energy store changes for the following objects:



b

A football that has been kicked upwards.

**As the ball moves upwards, the kinetic energy store of the ball decreases and the gravitational potential energy store of the ball increases.**

A squash ball hitting a wall.

**When the ball hits the wall, the kinetic energy store of the ball decreases and the elastic potential energy store increases. Some of the energy is also transferred to the surroundings. The thermal energy store of the surroundings increases and some of the energy is transferred by sound waves.**

A car accelerating.

**As the car moves, the chemical energy store of the petrol decreases and the kinetic energy store of the car increases. Some of the energy is also transferred by sound waves to the surroundings and the thermal energy store of the surroundings also increases.**

A car decelerating.

**As the car slows down, the kinetic energy store decreases and the thermal energy store of the surroundings and brakes increases. Some of the energy is also transferred by sound waves to the surroundings.**

Bringing water to the boil.

**Energy is transferred electrically from the chemical energy store in the power station to the heating element in the kettle and the thermal energy store of the water increases, which increases the kinetic energy stores of the particles that make up the water.**

What is the equation linking kinetic energy, mass and speed?

$$\text{kinetic energy} = \frac{1}{2} \times \text{mass} \times (\text{speed})^2$$

Write the units for the following:

kinetic energy:  $(E_k)$ , joules, J

mass:  $(m)$ , kilograms, kg, grams, g

speed:  $(v)$ , metres per second, m/s

List some examples of objects with kinetic energy stores.

**(These are just a few examples. There will be many more.)**

**Toy car travelling down a ramp.**

**Parachute falling through the air.**

**Gas particles moving in the air.**

c

What is the equation linking change in thermal energy, mass, specific heat capacity and temperature change?

$$\text{change in thermal energy} = \text{mass} \times \text{specific heat capacity} \times \text{temperature change}$$

Write the units for the following:

change in thermal energy:  $(\Delta E)$ , joules, J

specific heat capacity:  $(c)$ , joules per kilogram per degree Celsius, J/kg °C

Write a definition for specific heat capacity.

**The amount of energy needed to increase the temperature of a 1kg material by 1°C.**

f

What is the equation linking elastic potential energy, spring constant and extension?

$$\text{elastic potential energy} = \frac{1}{2} \times \text{spring constant} \times (\text{extension})^2$$

Write the units for the following:

elastic potential energy:  $(E_e)$ , joules, J

spring constant:  $(k)$ , newtons per metre, N/m

extension:  $(e)$ , metres, m

List some examples of objects with elastic potential energy stores.

**(These are just a few examples. There will be many more.)**

**Stretched elastic band.**

**Tennis ball that has been squashed.**

**Extended spring.**

d

Define Power.

**The rate at which energy is transferred.**

**The rate at which work is done.**

What is the equation linking power, energy transferred and time?

$$\text{power} = \text{energy transferred} \div \text{time}$$

What is the equation linking power, work done and time?

$$\text{power} = \text{work done} \div \text{time}$$

Write the units for the following:

power:  $(P)$ , watts, W

energy transferred:  $(E)$ , joules, J

time:  $(t)$ , seconds, s

work done:  $(E)$ , joules, J

An LED bulb has a power rating of 8W, a halogen bulb has a power rating of 28W but they both have a similar brightness. What is the difference?

**The LED bulb transfers less energy per second than the halogen bulb.**

The power output of a hairdryer is 2000W. How much energy is transferred per second?

**2000 joules per second.**

g

What is the equation linking gravitational potential energy, mass, gravitational field strength and height?

$$\text{gravitational potential energy} = \text{mass} \times \text{gravitational field strength} \times \text{height}$$

Write the units for the following:

gravitational potential energy:  $(E_p)$ , joules, J

mass:  $(m)$ , kilograms, kg

gravitational field strength:  $(g)$ , newtons per kilogram, N/kg

height:  $(h)$ , metres, m

List some examples of objects that have gravitational potential energy stores.

**(These are just a few examples. There will be many more.)**

**Apple on a tree.**

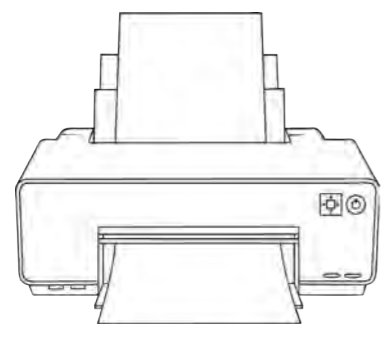
**Plant pot on a windowsill.**

**Aeroplane in the sky.**

e



a  
 What is the law of conservation of energy?  
**Energy cannot be created or destroyed. It can be transferred, stored or dissipated.**  
 Define dissipation.  
**Energy being transferred to the surroundings.**


b  
 The following questions are about energy stores and transfers in a printer.  
  
 The printer transfers energy from the chemical energy in the power station to the moving parts of the printer. How is the energy transferred from the power station to the printer? **electrically**  
 What is the final energy store? **kinetic**  
 Some of the energy to the printer is transferred to the surroundings. This energy is wasted. How is the energy transferred to the surroundings? **by heating**  
 What is the final energy store? **internal (thermal)**

c  
 For the following situations, suggest methods to reduce unwanted energy transfers and what the unwanted energy transfers are.  
 Hot water stored in a tank.  
**Insulation around the water tank. Reduces dissipation of energy to the surroundings into thermal energy stores.**  
 Moving parts in a car.  
**Lubricating the moving parts. Reduces dissipation of energy to the surroundings into thermal energy stores.**

d  
 Describe how thermal conductivity of a material affects how it transfers energy by conduction.  
**If a material has a high thermal conductivity, it will transfer heat via conduction at a much quicker rate.**

e  
 How is energy lost from a building? What factors affect this?  
**Energy is transferred to thermal energy stores of the surroundings. The factors that affect this are the thermal conductivity of the walls and the thickness of them.**

f  
 What is the equation linking efficiency, useful output energy transfer and total input energy transfer?  
**efficiency = useful output energy ÷ total input energy transfer**  
 What is the equation linking efficiency, useful power output and total power input?  
**efficiency = useful power output ÷ total power input**  
 When energy is transferred in a closed system, what happens to the total amount of energy?  
**Total energy does not change.**  
 How can the efficiency of an energy transfer be increased?  
**By increasing the useful output by reducing the wasted energy.**

g  
 Which lorry is more energy efficient and why?  
  
**The red lorry is streamlined and so is more energy efficient. It wastes less energy due to air resistance and so has a higher useful output energy.**

h  
 List the main energy resources.  
 Fossil fuels (coal, oil and gas) N      Nuclear fuel N      Biofuel R  
 Wind R      Hydroelectricity R      Geothermal R  
 Tidal R      Waves R      Sun R

i  
 Define renewable and non-renewable energy resources.  
**A renewable energy resource can be replenished.**  
**A non-renewable energy resource will eventually run out.**

j  
 For the energy resources that you have listed, write an R next to those that are renewable and N next to those that are non-renewable.  
 Except for oil, all energy resources are used for electricity generation. Which are used for heating?  
**geothermal, solar, fossil fuels (coal, oil and gas)**

k  
 My main areas for improvement are:  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Energy Resource	Environmental Impact	Reliability of Output
Coal	Produces carbon dioxide, a greenhouse gas and sulphur dioxide which contributes to acid rain.	Reliable.
Oil	Produces carbon dioxide, nitrogen dioxide and sulphur dioxide. If it is spilt there can be disastrous environmental consequences.	Reliable.
Gas	Produces carbon dioxide.	Reliable.
Nuclear	Produces radioactive waste.	Reliable.
Biofuel	A lot of land is needed for growing the fuel.	Reliable.
Wind	Can be noisy and the turbines are dangerous for birds.	Unreliable.
Hydroelectricity	Large areas of land are needed and can cause disruption to ecosystems.	Reliable.
Geothermal	None.	Reliable.
Tidal	Can affect habitats.	Not always reliable due to changing tides.
Waves	Can affect habitats.	Unreliable.
Solar	None.	Unreliable.

Draw the symbol diagrams for:

<b>switch (open)</b>	<b>switch (closed)</b>
<b>lamp</b>	<b>fuse</b>
<b>diode</b>	<b>LED</b>
<b>cell</b>	<b>battery</b>
<b>voltmeter</b>	<b>ammeter</b>
<b>resistor</b>	<b>variable resistor</b>
<b>thermistor</b>	<b>LDR</b>

What is electric current?  
\_\_\_\_\_

What is the equation that links charge flow, current and time?  
\_\_\_\_\_

Write the symbols and units for the following.

charge flow: \_\_\_\_\_

current: \_\_\_\_\_

time: \_\_\_\_\_

What is the equation that links current, potential difference and resistance?  
\_\_\_\_\_

Write the symbols and units for the following:

potential difference: \_\_\_\_\_

resistance: \_\_\_\_\_

If you were measuring resistance, what would you need to measure and what components would you need?  
\_\_\_\_\_  
\_\_\_\_\_

Draw a circuit diagram including the following components:  
**ammeter, voltmeter, battery, lamp, variable resistor.**

**Resistors**  
Draw the current-potential difference graphs for:

resistor

filament lamp

diode

Look at the graphs you drew in box e. Which graphs show a linear relationship and which show a non-linear relationship?  
\_\_\_\_\_  
\_\_\_\_\_

**Thermistor:** as temperature increases, resistance \_\_\_\_\_

Uses: \_\_\_\_\_

**LDR:** as intensity increases, resistance \_\_\_\_\_

Uses: \_\_\_\_\_

Complete the table:

Type of Circuit	Potential Difference: Shared or the Same?	Current: Same or Split between Branches?

What is the effect on the total resistance of adding resistors into a:

a. series circuit? \_\_\_\_\_

b. parallel circuit? \_\_\_\_\_

For the below circuit, calculate the total resistance.

Total resistance = \_\_\_\_\_

In the UK, mains electricity has an ac supply. Explain the difference between ac and dc.  
\_\_\_\_\_  
\_\_\_\_\_

Label the diagram of the 3-point plug:

What is the purpose of the three core cables in electrical appliances?

live wire: \_\_\_\_\_

neutral wire: \_\_\_\_\_

earth wire: \_\_\_\_\_

How would you make sure that the live wire to a switch is dead?  
\_\_\_\_\_  
\_\_\_\_\_

Explain why it is dangerous to have any connection between the live wire and the Earth.  
\_\_\_\_\_  
\_\_\_\_\_

**a**

What is the equation linking power, potential difference and current?  
 \_\_\_\_\_  
 \_\_\_\_\_

What is the equation linking power, current and resistance?  
 \_\_\_\_\_  
 \_\_\_\_\_

Write the symbol and unit for power.  
 \_\_\_\_\_  
 \_\_\_\_\_

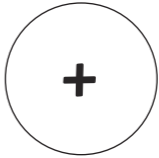
**e**

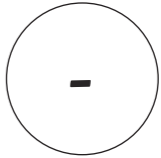
Why is energy transferred at such a high voltage in cables?  
 \_\_\_\_\_  
 \_\_\_\_\_

Describe how the following work:  
 a. step-up transformer: \_\_\_\_\_  
 b. step-down transformer: \_\_\_\_\_

**h**

Complete the diagrams below to show the electric fields around positively and negatively charged spheres.





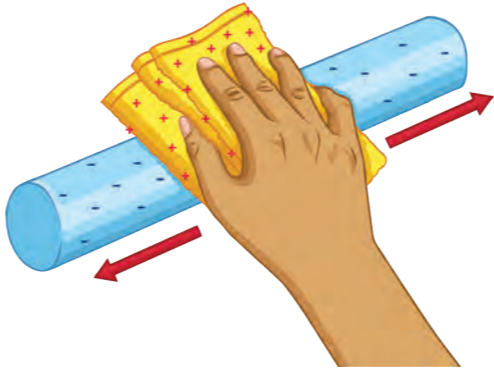
**b**

Describe how each of the appliances below transfers energy.

**Kettle**  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Hairdryer**  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**f**



Describe what happens to these insulating materials (above) when they are rubbed together.  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

What happens when two objects are brought together that have:  
 a. the same charge? \_\_\_\_\_  
 b. the opposite charge? \_\_\_\_\_

**i**

Charged objects have an electric field around them.

Where is this field the strongest?  
 \_\_\_\_\_

What happens to the field strength as you go further away from the charged object?  
 \_\_\_\_\_  
 \_\_\_\_\_

Charged objects exert a force on one another when they are brought close together.

What is this type of force called?  
 \_\_\_\_\_

Where is the force the greatest?  
 \_\_\_\_\_  
 \_\_\_\_\_

**c**

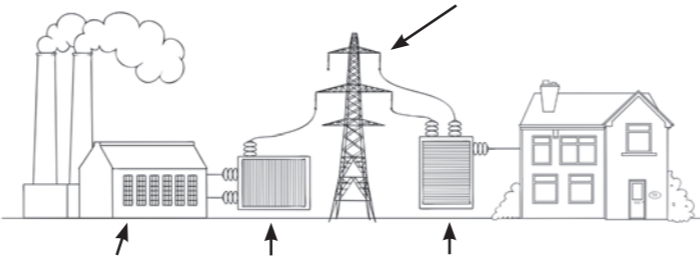
What is the equation linking energy transferred, power and time?  
 \_\_\_\_\_  
 \_\_\_\_\_

What is the equation linking energy transferred, charge flow and potential difference?  
 \_\_\_\_\_  
 \_\_\_\_\_

Write the symbol and unit for energy transferred.  
 \_\_\_\_\_  
 \_\_\_\_\_

**g**

Label the National Grid diagram.



**j**

List some everyday examples of static electricity:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

**d**

Describe the relationship between the power ratings of appliances and the changes in stored energy when they are in use.  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**k**

My main areas for improvement in this topic are:  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Draw the symbol diagrams for:

switch (open)	switch (closed)
lamp	fuse
diode	LED
cell	battery
voltmeter	ammeter
resistor	variable resistor
thermistor	LDR

What is electric current?

**Electric current is the flow of charge.**

What is the equation that links charge flow, current and time?

**charge flow = current × time**

Write the symbols and units for the following.

charge flow: (Q) – coulombs, C

current: (I) – amperes, A

time: (t) – seconds, s

What is the equation that links current, potential difference and resistance?

**Potential difference = current × resistance**

Write the symbols and units for the following:

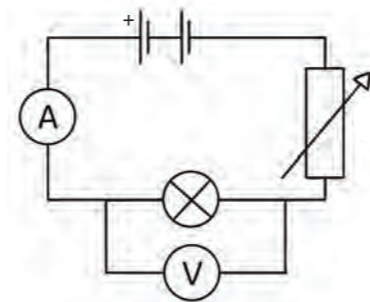
potential difference: (V) – volts, V

resistance: (R) – ohms, Ω

If you were measuring resistance, what would you need to measure and what components would you need?

**Current and potential difference using an ammeter and voltmeter respectively.**

Draw a circuit diagram including the following components: **ammeter, voltmeter, battery, lamp, variable resistor.**

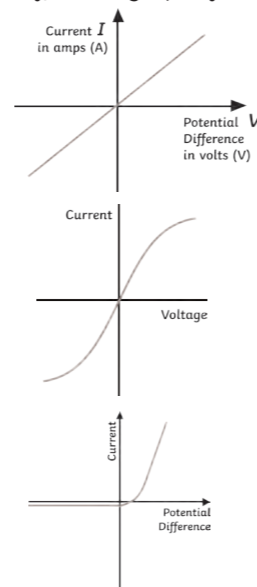


**Resistors**

Draw the current-potential difference graphs for: resistor

filament lamp

diode



Look at the graphs you drew in box e. Which graphs show a linear relationship and which show a non-linear relationship?

**The ohmic conductor shows a linear relationship. The filament lamp and diode both show non-linear relationships.**

**Thermistor:** as temperature increases, resistance **decreases**

Uses:

**temperature detectors in car engines or thermostats**

**LDR:** as intensity increases, resistance **decreases**

Uses:

**street lights**

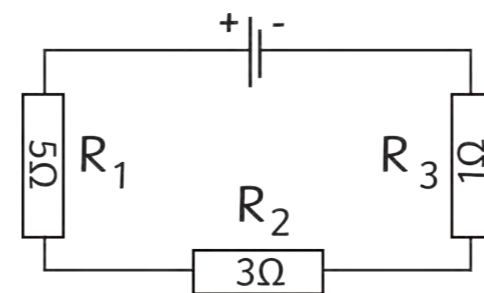
Complete the table:

Type of Circuit	Potential Difference: Shared or the Same?	Current: Same or Split between Branches?
series	shared	same
parallel	same	split between branches

What is the effect on the total resistance of adding resistors into a:

- a. series circuit? **Increase in the total resistance.**
- b. parallel circuit? **Decrease in the total resistance.**

For the below circuit, calculate the total resistance.



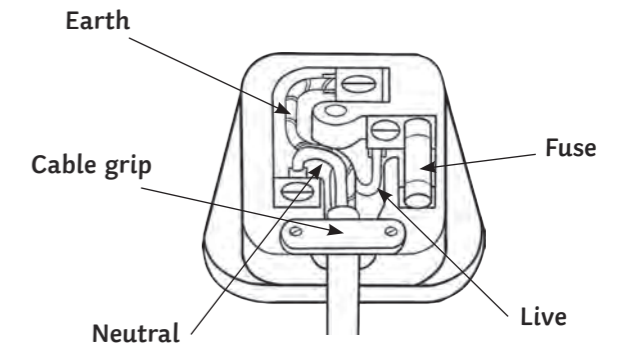
Total resistance = **9 Ω**

In the UK, mains electricity has an ac supply. Explain the difference between ac and dc.

**In direct current, the electrons flow in one direction only.**

**In alternating current, the flow of electrons changes.**

Label the diagram of the 3-point plug:



What is the purpose of the three core cables in electrical appliances?

live wire: **the alternating current from the mains supply flows through this.**

neutral wire: **this completes the circuit.**

earth wire: **this usually does not have a current running through it. It is a safety feature to prevent the appliance becoming live.**

How would you make sure that the live wire to a switch is dead?

**Switch off the supply from the main circuit board or remove the fuse from the main circuit board and test that it's dead.**

Explain why it is dangerous to have any connection between the live wire and the Earth.

**This is a short circuit which will cause a high current to flow and could cause a fire. If the fuse did not blow then a person touching it could also get electrocuted.**

**a**

What is the equation linking power, potential difference and current?  
**power = potential difference × current**

What is the equation linking power, current and resistance?  
**power = (current)<sup>2</sup> × resistance**

Write the symbol and unit for power.  
**Power (P) – watts, W**

**b**

Describe how each of the appliances below transfers energy.

**Kettle**  
**Energy is transferred electrically from chemical energy stores in the power station to the internal (thermal) energy store of the heating element of the kettle.**

**Hairdryer**  
**Energy is transferred electrically from chemical energy stores in the power station to the kinetic energy store of the motor and the internal (thermal) energy store of the heating element of the hairdryer.**

**c**

What is the equation linking energy transferred, power and time?  
**energy transferred = power × time**

What is the equation linking energy transferred, charge flow and potential difference?  
**energy transferred = charge flow × potential difference**

Write the symbol and unit for energy transferred.  
**energy transferred (E) – joules, J**

**d**

Describe the relationship between the power ratings of appliances and the changes in stored energy when they are in use.  
**An appliance with a higher power rating will transfer stored energy to other types of energy at a faster rate than one with a lower power rating.**

**e**


Why is energy transferred at such a high voltage in cables?  
**High voltages mean that the energy is transferred at low currents. This results in less resistance and therefore less energy is lost as heat.**

Describe how the following work:

a. step-up transformer: **voltage is increased.**

b. step-down transformer: **voltage is decreased.**

**f**



Describe what happens to these insulating materials (above) when they are rubbed together.  
**When the cloth and acetate are rubbed together, friction causes electrons to be transferred from the cloth to the acetate. The acetate gains electrons so becomes negatively charged. The cloth loses electrons so becomes positively charged.**

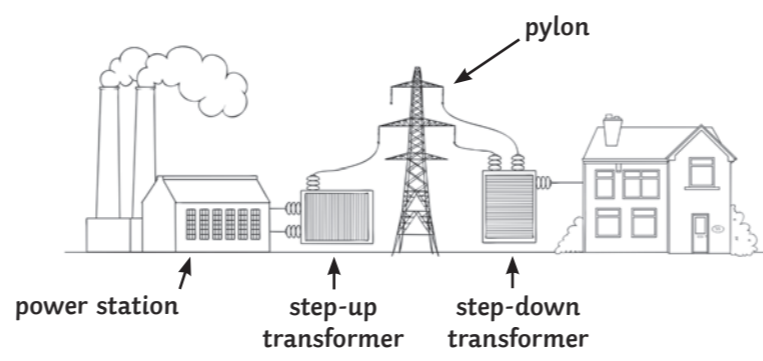
What happens when two objects are brought together that have:

a. the same charge? **They repel.**

b. the opposite charge? **They attract.**

**g**

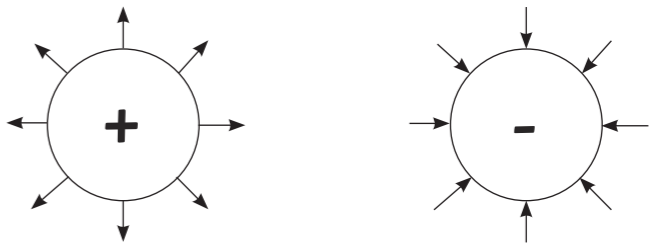
Label the National Grid diagram.



power station      step-up transformer      pylon      step-down transformer

**h**

Complete the diagrams below to show the electric fields around positively and negatively charged spheres.



**i**

Charged objects have an electric field around them.  
 Where is this field the strongest?  
**The field is strongest closer to the charged object.**

What happens to the field strength as you go further away from the charged object?  
**As you go further away from the object, the field strength decreases.**

Charged objects exert a force on one another when they are brought close together.  
 What is this type of force called?  
**Non-contact force.**

Where is the force the greatest?  
**The force is greatest closer to the object.**

**j**

List some everyday examples of static electricity:

- Giving someone an electric shock after sliding down the stairs.**
- Getting an electric shock from taking a jumper off.**
- A balloon causing hair to stand on end when it has been rubbed against a jumper.**

(This is not an exhaustive list. Students may come up with many more.)

a What is the equation linking density, mass and volume?

\_\_\_\_\_

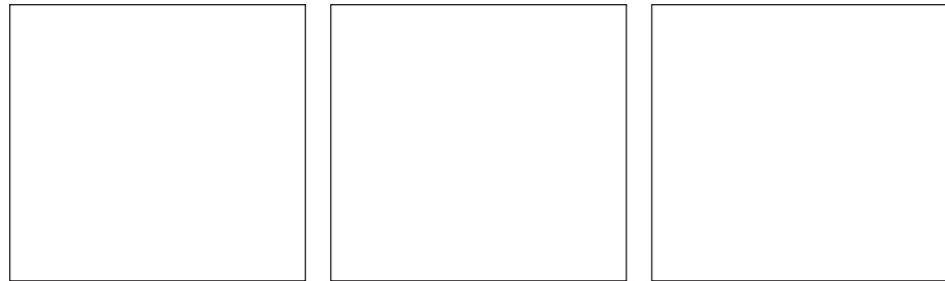
b Write the symbols and units for the following:

density: \_\_\_\_\_

mass: \_\_\_\_\_

volume: \_\_\_\_\_

c Draw the particle models for solids, liquids and gases.



d Describe the three states of matter in terms of structure, shape and movement of the particles.

solid - \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

liquid - \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

gas - \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

e Why is a change of state referred to as a physical change and not a chemical change?

\_\_\_\_\_

\_\_\_\_\_

f Describe the displacement technique used to determine the volume of an irregularly shaped object.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

g When substances change state, their mass is conserved. What does this mean?

\_\_\_\_\_

\_\_\_\_\_

Describe how to determine the volume of a regularly shaped object.

\_\_\_\_\_

\_\_\_\_\_

h What is an internal system?

\_\_\_\_\_

\_\_\_\_\_

i Define internal energy.

\_\_\_\_\_

\_\_\_\_\_

j List some factors that affect the increase of temperature of a system.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

k Explain the differences in density of solids, liquids and gases.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

l Define specific heat capacity.

\_\_\_\_\_

\_\_\_\_\_

m What is the equation linking change in thermal energy, mass, specific heat capacity and temperature?

\_\_\_\_\_

\_\_\_\_\_

n Write the units and symbols for the following:

energy: \_\_\_\_\_

mass: \_\_\_\_\_

specific heat capacity: \_\_\_\_\_

temperature change: \_\_\_\_\_

o After a long journey, the temperature of a car tyre increases. What is the effect on the gas particles within the tyre?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

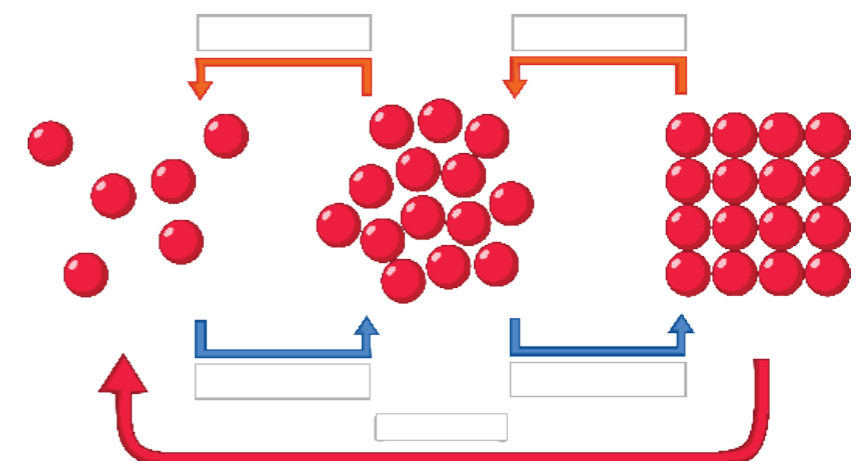
\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



p Label the diagram with the terms used for changes of state.



Define latent heat.

---



---



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a

For the heating and cooling curve (shown in section J), what are the terms used to describe the changes of state for:

B → C \_\_\_\_\_

D → E \_\_\_\_\_

E → D \_\_\_\_\_

C → B \_\_\_\_\_

g

What is the equation linking energy for a change of state, mass and specific latent heat?

---

Write the symbol and unit for the following:

specific latent heat: \_\_\_\_\_

b

What is happening to the particles between A-B, C-D and E-F?

---

How are kinetic energy of particles and temperature related?

---



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h

Describe the difference between specific latent heat of fusion and specific latent heat of vaporisation.

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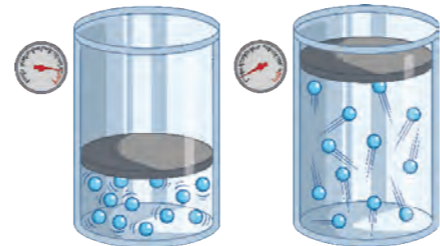
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c

Using the diagram, explain the effect of an increase of volume on pressure.



(a) High pressure (b) Low pressure

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---



---

i

Distinguish between specific heat capacity and specific latent heat.

---



---



---

d

What is the equation that links pressure and volume?

---

List the symbols and units for the following:

pressure: \_\_\_\_\_

volume: \_\_\_\_\_

e

Explain the effect of an increase in temperature on the pressure of a gas in a container.

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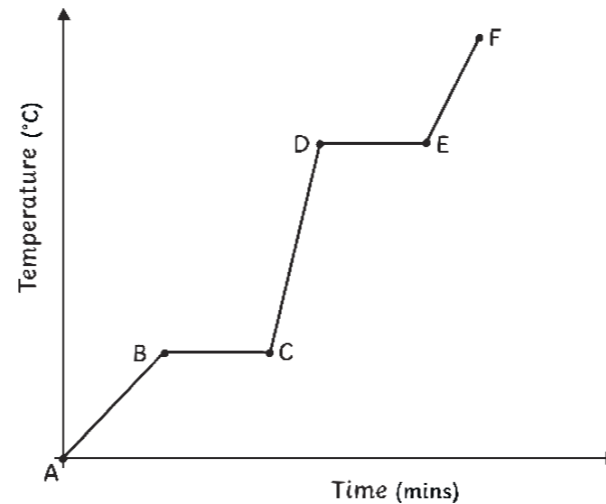
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f

What are the states of matter for the diagonal sections of the graph? Add labels to the graph below.



j

When work is done on a gas, what effect is there on the internal energy of the gas?

---

When work is done on a gas what effect can there be on the temperature of the gas?

---

k

l



m

Using the image above, explain what happens to:

a) The internal energy of the gas within the tyre:

---

b) The energy of the particles:

---

c) The temperature of the gas:

---

n

My main areas for improvement in this topic are:

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What is the equation linking density, mass and volume?

**density = mass ÷ volume**

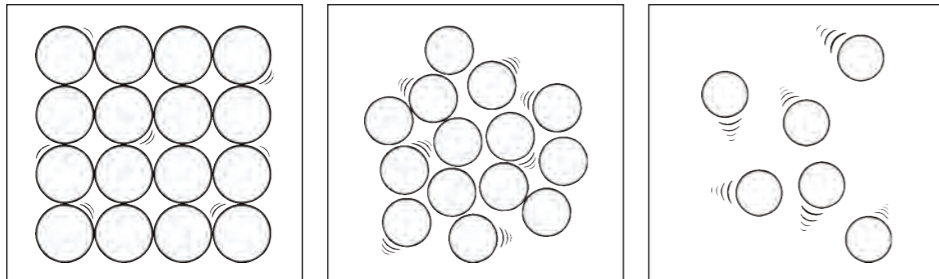
Write the symbols and units for the following:

density: ( $\rho$ ) kilograms per metre cubed,  $\text{kg/m}^3$

mass: ( $m$ ), kilograms,  $\text{kg}$

volume: ( $V$ ), metres cubed,  $\text{m}^3$

Draw the particle models for solids, liquids and gases.



Describe the three states of matter in terms of structure, shape and movement of the particles.

**solid – They have a regular structure and the particles are packed closely together so they have a definite shape. The particles are in a fixed position but do vibrate.**

**liquid – They have an irregular structure and the particles are close together. They take the shape of the container but do not have a definite shape. The particles vibrate and move over one another.**

**gas – The particles are widely dispersed and do not have a definite shape. The particles move around rapidly.**

Why is a change of state referred to as a physical change and not a chemical change?

**If the changes are reversed then the material will recover its original properties.**

Describe the displacement technique used to determine the volume of an irregularly shaped object.

**Fill a displacement vessel/eureka can with water. Put the spout of the can over a measuring cylinder. Put the irregularly shaped object into the can and measure the volume of water displaced.**

When substances change state, their mass is conserved. What does this mean?

**The mass of the substance does not change once it has changed state.**

Describe how to determine the volume of a regularly shaped object.

**width × length × height**

What is an internal system?

**An internal system is one in which the energy is stored by the particles within it.**

Define internal energy.

**This is the total kinetic and potential energy of the particles that make up that system.**

List some factors that affect the increase of temperature of a system.

**Mass of the substance.**

**Type of material being heated.**

**Energy input.**

Explain the differences in density of solids, liquids and gases.

**Solids are very dense because the particles are so closely packed together and there are strong forces of attraction between them. Liquids are less dense than solids, but more dense than gases because the particles are very close together and attract one another. Gases are the least dense and have very weak forces of attraction only when they collide.**

Define specific heat capacity.

**The amount of energy needed to cause a 1°C rise in 1kg of a substance.**

What is the equation linking change in thermal energy, mass, specific heat capacity and temperature?

**change in thermal energy = mass × specific heat capacity × temperature change**

Write the units and symbols for the following:

energy: ( $E$ ), joules,  $\text{J}$

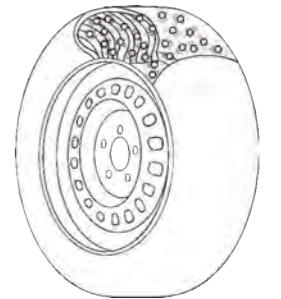
mass: ( $m$ ), kilograms,  $\text{kg}$

specific heat capacity: ( $c$ ), Joules per kg per degree Celsius,  $\text{J/kg } ^\circ\text{C}$

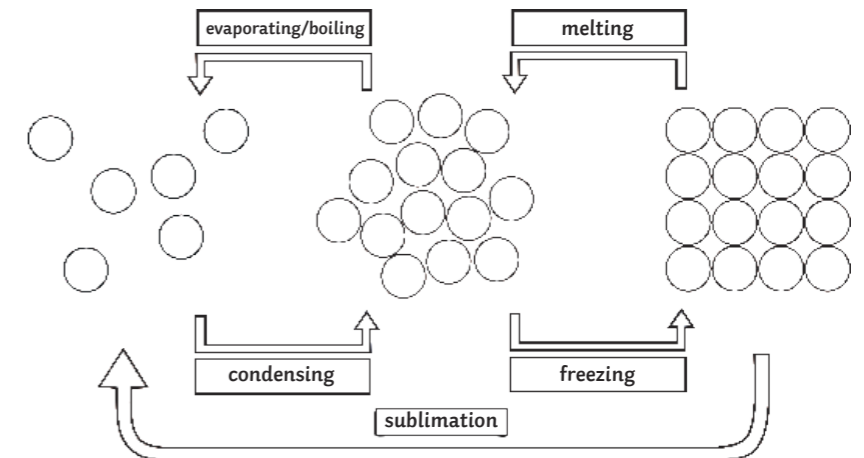
temperature change: ( $\Delta$ ), degrees Celsius,  $^\circ\text{C}$

After a long journey, the temperature of a car tyre increases. What is the effect on the gas particles within the tyre?

**The gas particles will gain more kinetic energy, therefore they will move around more.**



Label the diagram with the terms used for changes of state.



a Define latent heat.  
**Latent heat is the energy required for the change of state of a substance.**

b What is the equation linking energy for a change of state, mass and specific latent heat?  
**Energy for a change of state = mass x specific latent heat**  
 Write the symbol and unit for the following:  
 specific latent heat: **(L), joules per kilogram, J/kg**

c Describe the difference between specific latent heat of fusion and specific latent heat of vaporisation.  
**Specific latent heat of fusion is the amount of energy needed to change 1kg of a substance from a solid to a liquid with no change of temperature. Specific latent heat of vaporisation is the amount of energy needed to change 1kg of a substance from liquid to gas with no change of temperature.**

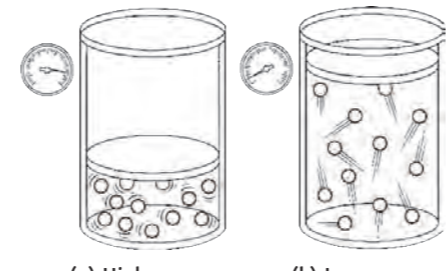
d Distinguish between specific heat capacity and specific latent heat.  
**Specific heat capacity is the amount of energy required to increase the temperature of a substance, whereas specific latent heat is the energy needed to change the state of a substance with no temperature change.**

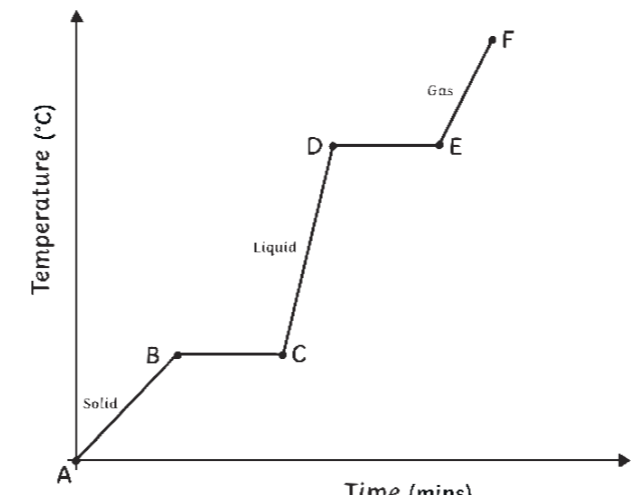
e What is the equation that links pressure and volume?  
**Pressure x volume = constant**  
 List the symbols and units for the following:  
 pressure: **(p), pascals, Pa**  
 volume: **(V), metres cubed, m<sup>3</sup>**

f Explain the effect of an increase in temperature on the pressure of a gas in a container.  
**An increase in temperature causes more collisions of the gas particles with the walls of the container. This causes an increase in the force on the walls of the container over a particular area and so increases the pressure.**

g For the heating and cooling curve (shown in section J), what are the terms used to describe the changes of state for:  
**B → C Melting**  
**D → E Evaporating/Boiling**  
**E → D Condensing**  
**C → B Freezing**

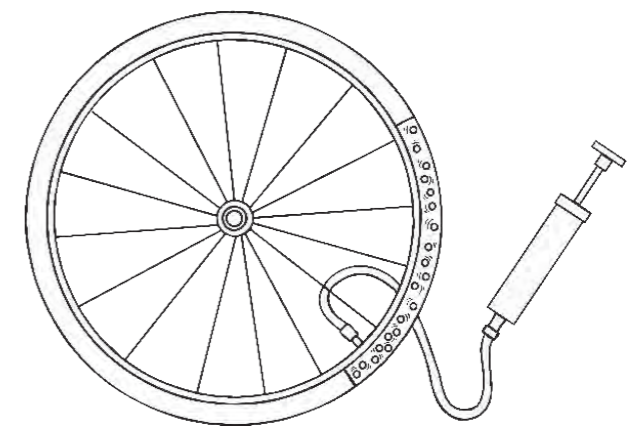
h What is happening to the particles between A-B, C-D and E-F?  
**They are gaining kinetic energy and spreading out more.**  
 How are kinetic energy of particles and temperature related?  
**As the temperature increases the kinetic energy of the particles increases.**

i Using the diagram, explain the effect of an increase of volume on pressure.  
  
**(a) High pressure (b) Low pressure**  
**An increase in volume causes the particles to spread out more and so the number of collisions on the walls of the container decreases. So, there is less force exerted on the container over a certain area and therefore a lower pressure.**

j What are the states of matter for the diagonal sections of the graph? Add labels to the graph below.  
  
**Solid** (between A and B)  
**Liquid** (between C and D)  
**Gas** (between E and F)

k When work is done on a gas, what effect is there on the internal energy of the gas?  
**The internal energy of the gas increases.**

l When work is done on a gas what effect can there be on the temperature of the gas?  
**The temperature can increase.**

m   
 Using the image above, explain what happens to:  
 a) The internal energy of the gas within the tyre:  
**The internal energy of the gas increases.**  
 b) The energy of the particles:  
**The particles gain kinetic energy.**  
 c) The temperature of the gas:  
**The temperature of the gas increases.**

n My main areas for improvement in this topic are:  
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